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FAR FRONTIER

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JERRY POURNELLE AND JIM BAEN

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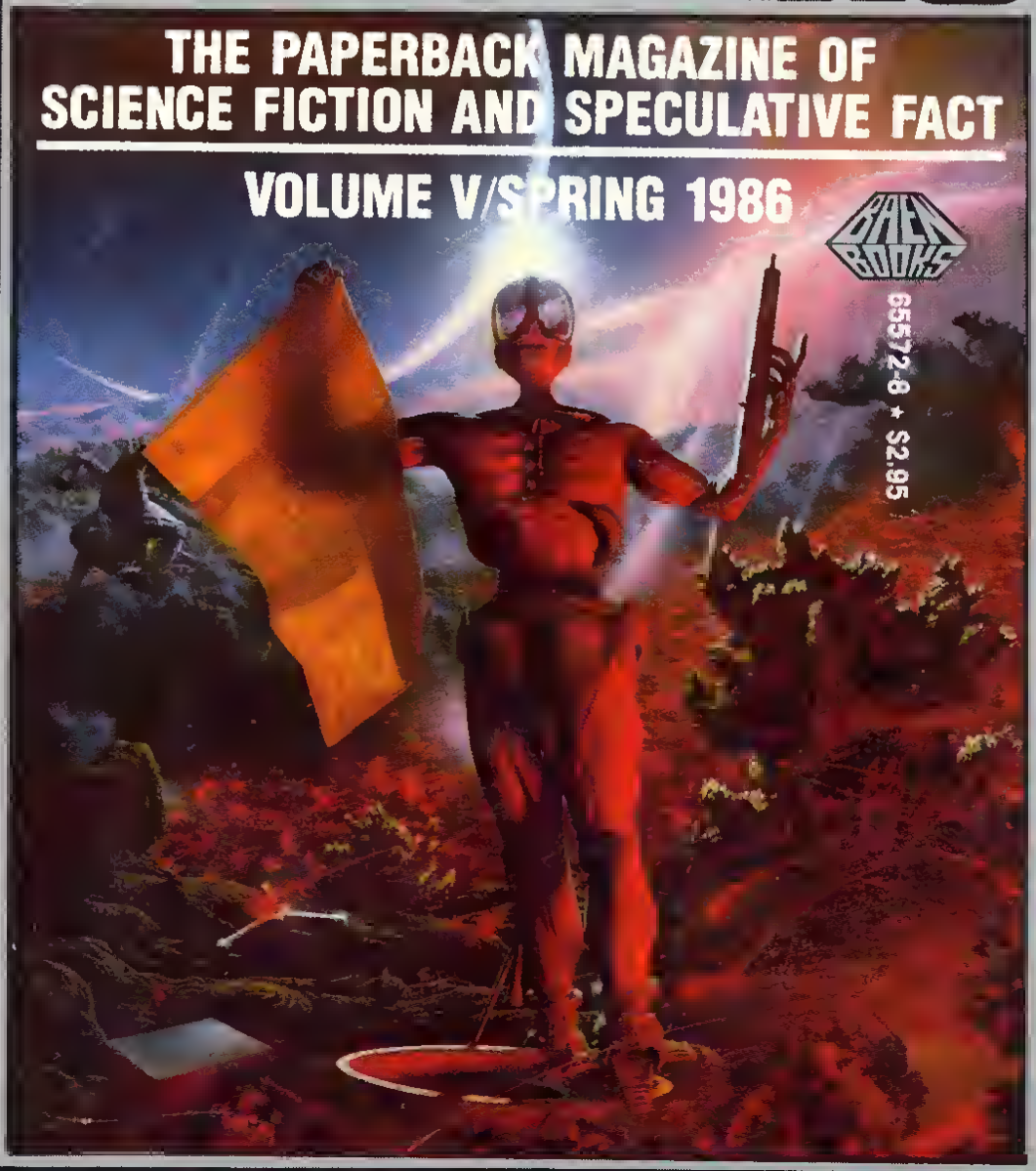
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FAR FRONTIERS

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EDITOR'S INTRODUCTION TO:

A LION TO THE SEA

Because practiced soldiers fight more competently than half-trained levies, militarized cultures tend to overrun those that regard the military arts as at best an odious necessity. This is the central dilemma of the human condition. Sparta vs. Athens; Rome vs. Carthage; Rome vs. Greece; Mongols vs. Chinese; Mongols vs. Arabs; Arabs vs. East Romans: the list of "cultural conflicts" in which violence solved everything in favor of the better fighters is endless; "I did not raise my boy to be a soldier" loses, every time, to "With your shield, or on it."

This tendency is only ameliorated by the fact that excellence in the arts of peace may increase a culture's fecundity, and so its military potential. Totalitarian states, so adept at marshaling resources, are not so good at creating them. Therein lies our hope. *Our* hope.

In "A Lion to the Sea" John Dalmas examines the situation of a people with no hope at all. Ultimate cultural specialists in the art of organized violence, they have met *genetic* specialists.

—JPB

"A Lion to the Sea" *is taken from Jerry Pournelle's new shared universe anthology/novel,* Warworld, *to be published by Baen Books, probably in 1987. Warworld is a planet infested by the remnants of Jerry's Sauron Supermen, last heard from in* The Mote in God's Eye. *The Saurons have a double mission: to see that nobody on Warworld develops a technology capable of calling the interstellar cops, and to breed more Saurons. Lots more Saurons.*

A Lion to the Sea

John Dalmas

A trio of Dinneh scouts, of the Cliff Lion Clan, crept from thick mountain jungle onto a rocky point about a hundred feet above a beach. The tide was rising, but a kilometer-wide tidal flat still lay exposed to the strong light of the morning sun. The sun had been up only an hour, and the breeze was still chill after the long semi-night's sixty hours of net radiation loss.

Cats-Eye, slowly approaching the zenith from the west, was a pale white crescent, its apparent diameter seven and a half times that of Luna seen from Earth, its dully glowing nightside hardly visible in the dominating light of the new day.

A brook flowed from the adjacent small canyon to snake its way across the tidal flat toward the sea, eroding newly through sediments that refilled its course with sand in each 130-hour tidal cycle.

The Dinneh stared. They had heard only vague reports of the sea until, a few standard days previous, they'd seen it distantly from a high mountain to

the east. Of tides they knew nothing; to them, the water's edge might have been immutable, although to these desert people, bodies of water came and went with the seasons.

At any rate, the scouts gave their attention only briefly to the sea, for on the flat near the most recent high tide line they saw something of more immediate interest: four strange artifacts—log rafts of about seven meters on a side, each holding numerous large leather sacks, fat and rounded. On each raft a pair of long poles—sculls—lay across the deck mats, with a spar removed from its housing, its sail furled, ropes coiled.

Seven men in serapes, with short beards and short, rough-chopped blond or sun-bleached hair, were filling more sacks with water at the brook. The pace of their work was leisurely, even lethargic. The last high tide had left them there more than one hundred hours previously. Most of their work was done, but they could not leave until the tide returned to lift their rafts free.

The Dinneh scouts, of course, saw only the physical realities. The functions and meanings were mysteries to them. To their eyes, the strange men somewhat resembled Sauron soldiers physically, but their manner was far different. For one thing, they did not seem to be keeping any sort of military security. In fact, the Dinneh warriors could not even see a bow or spear among the strangers—only shortswords and knives.

Quick Spirit had never seen a raft before. Even the concept was unfamiliar. But lying on his belly on the bluff, he nonetheless began to suspect what the rafts were for, and that the driftwood row and scattered strands of seaweed marked a recent water level.

He was not called Quick Spirit without good reason. To the Dinneh, intelligence was a function of the spirit.

Even the novelties on the beach, however, did not long hold their attention. The early sun was low behind them, the angle perfect for distant seeing westward, and from their elevation, their eyes, sharpened by life-style and generations of the infusion of stolen Sauron genes, saw a vast floating something well out to sea. And gradually Quick Spirit realized what this must be, too, though he had no name for it.

Then the Dinneh scouts slithered back from the cliff's brink and trotted to their clan, which had broken camp at sunrise and was picking its hurried way down the bouldery canyon bottom, in the creek bed, which was the best, if difficult, track through the mountain jungle.

They had seen worse—broken mountains so rugged that the Dinneh had abandoned most of their mounts, converting some into meat for the trail. They had actually hoisted or lowered the remainder with rope slings in several more difficult places, a terribly slow and arduous task, for even the muskylope, even the desert variety, is a large animal. These were their best breeding stock, used now to carry small children and such pregnant women as were nearing full term.

The pace had been especially hard lately. One had to keep up or fall behind; the clan could no longer wait or even slow down for stragglers. They assumed that the Saurons still tracked them, for the Saurons were relentless in all things.

For centuries, the Dinneh had been a careful tributary people to the Sauron soldiers, giving up the demanded periodic tribute of young women without protest, that the supermen might not destroy them, until it had become a natural part of life.

They had even had a covert victory to assuage their pride. Their distant ancestors had been Amerind livestockmen on Terra, with both a practical and

a theoretical knowledge of genetics learned in the universities there. The Dinneh had not forgotten the principles. And they had long since succeeded in obtaining an honor unique among the tributary peoples of the Saurons: they had succeeded in having a Sauron warrior-in-residence assigned to each clan. No one else had ever asked such a thing. The Dinneh had requested it on the stated rationale that luck was contagious, and surely the Saurons were the luckiest of all people.

The Sauron commander found this so amusing that he granted it.

And Dinneh women would entice the Sauron stationed with their clan and had numerous children by Saurons, thus stealing genes from the supermen, and this had gone on for more than a dozen generations. This alteration of the Dinneh genetic pool in no way disturbed them, for they regarded the essence of the Dinneh not as genetic, but as a matter of culture and tradition.

Meanwhile, the Dinneh had not ceased to be a warrior people. On this moon of Cat's-Eye it had been necessary from the beginning—since their forced relocation from their reservations in the state of Arizona, on Terra, most of a millenium before. The coming of the Saurons had not changed that. It had simply added a force, the only force, that the Dinneh avoided fighting with.

And then one day a youth, enraged by some more flagrant Sauron offense, had put an arrow through the neck, the spine of the offender, an officer of a tribute party. The chiefs had given up the youth immediately, with disclaimers of any tribal responsibility, and with offers of restitution. The tribute party in turn had demanded that the young man's entire extended family, numbering more than twenty, be brought to them. Then the Saurons began to shoot

them all. In an eruption of fury, the clan had responded by massacring the tribute party.

Four of the Saurons had escaped unwounded into the desert savannah. The warriors had pursued them, but Sauron endurance and speed, sensory acuity and reflexes and commando skills, had allowed two to lose themselves and return to their distant fortress.

When the pursuing warriors had lost the trail, they'd gone back at once to the village. And there was no question in any mind how the Saurons would react. So riders had been sent out to notify all the clans. War parties had been dispatched to set ambushes in the long and rugged defile up which any Sauron force must come, to delay it, while the clans began an exodus, dispersing into the mountains. They knew not where they were going, nor had they any illusions that the Sauron supermen would not run them down and butcher them. But some, they hoped, would escape to keep the Dinneh alive on this world.

For four days—fifteen Terran standard days—the Lion Clan had pushed westward without sight or report of Saurons. Then two warriors of the Bear Clan had come upon the camp of the Lion Clan in a high mountain meadow where the people of the Lion had thought to rest awhile. And they told that a force of Saurons had found the Bear Clan, which had hoped itself safe after so many days; had attacked it by surprise, and with its terrible weapons killed almost all the people of the Bear.

The Lion Clan had cut short its rest and pushed on.

And now came Quick Spirit to the chief and his council, with this report of strange men and their stranger structures of logs and mats, and their water bags. The story brought a new expression to the chief's face. Before had been only grim determination, the look of a man who expected to be killed but would never quit. Now he and his council looked

like men with—not hope so much as something explicit to attempt. Men with a positive action to take, not simply flight.

The Lion Clan had with it families from three other clans—families that had failed to reach their clan assembly ground in time and had attached themselves to the Lions—and with these additions, the clan numbered more than three hundred, even after their losses on the trail. And now it seemed truly possible that the entire Dinneh might not perish to leave only their spirits crying on the wind.

First, the chief dispatched some older warriors, men who could no longer run fast, to watch at intervals along the back trail, giving them the clan's signal horns. As they trotted off, they knew they would never see their people again, but they said nothing. Next, he sent the scouts trotting ahead down the creek with a small party of warriors, under Quick Spirit's leadership. At the canyon's mouth, Quick Spirit stopped the others within the canebrake that curtained it, and slipped ahead to look again. What he had not been able to see from above was an armed lookout squatting on a very large boulder at the foot of the bluff. The man's unstrung bow still could not be seen, it lay on the rock beside him, but Quick Spirit knew it must be there, for he could see a quiver of arrows.

The lookout, his back to the bluff, scanned from his small prominence casually up and down the beach, not expecting to see any hostiles, or any other men at all, on this wild and isolated stretch of coast. The real hazard was not ashore, he thought, but at sea, where an occasional corsair could be found that, if he had numbers and daring enough to take on the raft clansmen, could easily catch their clumsy craft. Corsairs were the reason his people, the Norskuna, ordinarily stayed far out to sea, avoiding the continent's proximity.

Quick Spirit observed the lookout for a moment, then turned his attention to the small rafts—about fifty meters distant—and the foreign men who were almost done with their work. Besides the lookout, there were only the seven he had seen before.

The direct approach would be to shoot the lookout, then rush onto the beach and capture or kill the other strangers. But Quick Spirit often grasped what others did not, and he saw a problem. He could swim, a little, for during the rainy season, streams flowed in the canyons of home, and pools formed. And sometimes hunters crossed flooded playas by holding a length of dead wood, to splash their way across by kicking when the water became too deep to wade. But how to move these unfamiliar and ungainly objects to the much larger one which he could not even see from where he now crouched?

The obvious solution was to make the strangers take them, and negotiation, or perhaps trickery, seemed the most hopeful approach. Assuming the strangers could understand the pidgin Angli that the Dinneh, like many backcountry people, used for communication with foreigners.

And if negotiation failed, then they could attack.

Physically the strangers looked formidable. Except for the lookout, they had removed their serapes as the sun warmed the air, and the Indian was impressed by not only their size but their brawniness. In fact, these men had been oar pullers, net pullers, rope pullers from childhood, and if they lacked the athletic litheness of the Saurons, or of the Dinneh, their bodies nonetheless looked very, very strong.

But his warriors had their bows, if it came to that, and could easily kill them all. He hoped it would not come to that. The Dinneh had enemies enough with the Saurons; what they needed now were allies. Slipping back into the canebrake, Quick Spirit briefed his warriors, then walked openly out onto the beach,

open hands forward at the height of his head, palms out.

He walked out twenty meters onto the sand before even being noticed. Then the lookout saw the Apache and shouted, snatching up his heavy bow as he rose to his feet, hurrying to bend and string it. The other Norsku* also straightened, staring. Quick Spirit didn't pause, didn't change his open, vulnerable approach, didn't even keep his attention on the lookout, but watched instead the man whom he judged to be the leader of the strangers.

But there was one warrior who was perhaps quicker than he should have been. He stepped from the canebrake as the lookout nocked an arrow, and sent one of his own into the man's upper back. The lookout didn't cry out, just toppled forward off the tall rock with his heart pierced.

The man's fall caught the corner of Quick Spirit's eye, and he turned for a moment, shouting angrily at the warrior who had shot. Possibly the lookout would have shot Quick Spirit, but his instructions to the warriors had been to shoot only if he, Quick Spirit, was attacked. Now he had become a man bringing violence.

Meanwhile, the other strangers had taken up their swords, and one of them held an object which could only be a weapon. It had the look of a very small bow attached to a piece of wood. And he stood with one foot holding it down to help him draw the cord; obviously the bow was extremely stiff.

But Quick Spirit went on, hands still raised and open. "Me no want fight!" he called. "Me friend!"

*The raft people called themselves by the collective term *Norskuna*. The singular noun was *Norski*, the plural *Norsku*. The singular adjective was *Norsk*, the plural *Norska*. The language evolved from a patois of Norwegian and Swedish, as influenced by the variant usages of Finnic and Balt minority speakers.

Then an impulse took him. "Me people run away from Saurons!" Surely these strangers knew of the Saurons. And surely they also feared and hated them.

The one he'd guessed was the leader shouted back. "You fella stop there!" Quick Spirit stopped. The stranger was glowering, speaking to his companions in a language Quick Spirit had never heard, a language that had a tonality a little like that of the Dinneh.

"You say you friend?" the man demanded. "What kind friend you? One fella you killed one fella us. What kind friend kill us?"

Quick Spirit still held out his empty hands as before. "Me fella think you fella gonna shoot me. Me fella shoot first. Maybe you fella shoot me if he not be killed."

The other didn't answer at once. His burly body stood straight, sword in one large fist, his expression one of chagrin laid over with thought. His little group had one crossbow, and their longbow lay out of reach atop the boulder. And at any rate, he didn't know how many of the dark people watched from the jungle, or how many of them had bows, while he and his men were exposed out here on the beach.

"What you want?" he asked.

"Saurons come behind, want kill us. Us want go away over water, you take. Saurons not follow over water."

"How many fella you?"

Quick Spirit answered without hesitation. "Fifteen." He splayed his fingers—two hands, then one. "All got bow. Not want kill you fellas. Want you take us to . . ." He stopped. "To big thing same you stand on." He pointed at the raft on which the large blond man stood, then out to sea. "To big thing far out on water."

The Norski pursed his lips thoughtfully. If Saurons were following these people, they would come here,

and meanwhile the rafts were effectively stranded until the next high tide, which would not be until midmorning some time. The raftsman didn't think in terms of hours—the Norskuna had long since ceased to have clocks. But in Haven's long days it would be about seven more hours to midmorning—seven hours until high tide would float their rafts off the beach.

"How close Saurons?" he asked.

"Don't know. Mebbe soon, mebbe not till sun that place." Quick Spirit pointed at the zenith.

It might be long then, the Norski thought, for it would take nearly twenty slow hours for the sun to climb so high.

"We can no take you till Cats-Eye that place," the Norski said, and pointed a little short of the zenith. For this high tide would come higher than the last, he knew, and reach the raft a little before the tidal peak. "Then water come to rafts. Rafts too much big to pull to water." He made a decision. "But me fellas can take canoe, go to clan raft. Other me fellas come back plenty canoes, take you fellas away this place."

Quick Spirit didn't know the word 'canoe,' but before he could ask, the Norsk leader turned and gave an order to the others. These moved quickly, trotted the few meters to a log lying beside the creek, and turned it over. It was hollow!—a beautifully made dugout canoe with a close-set outrigger. Its sides were no thicker than a carvel-built skiff's. In a moment its bow was in the creek, and the men stood waiting.

While Quick Spirit stared, the Norsk leader started for it. Seven men were about three more than it was built to carry—it was a light work boat for use around rafts—but in a pinch . . . and this was a pinch.

Quick Spirit raised a quicker hand. "Wait! You no go 'way from us," he said, shaking his head firmly. "Me think you go 'way from us, you no come back this place. You stay or me fellas shoot."

The Norsku all stopped, stood motionless. "Okay," the leader said. "Eight too many fellas one canoe, but we take you 'long. You anyway not big fella."

Quick Spirit's thoughts raced. If they took only him, they could overpower him later and kill him. They'd never come back for any of the others if the raftmen all left now, no matter how he parleyed. But it was undeniable that the canoe could hold no more than eight, if that many.

"You right," he said. "Eight too many. You take three me fellas, two you fellas. Other you fellas stay this place. You, me, come back later, get other me fellas, you fellas."

He turned, calling to the other warriors, and all fifteen, lithe and sinewy, trail-hardened, came loping from the jungle with bows strung, arrows nocked but pointed groundward.

The big Norski raised his hand and shook his head, talking faster this time. "Two me fellas not 'nuff—not make canoe go 'nuff fast. Take too much long get to clan raft, too much long come back this place. Me take two you fellas. Two you fellas, four me fellas. Four us make canoe go very much fast to clan raft. Then come back this place, get others."

He ignored the semicircle of near-naked warriors around them, looked expectant as if assuming Quick Spirit's agreement. Behind his eyes he was thinking that if the Saurons came too soon, at least only three of his people would be left behind.

Quick Spirit frowned for only a moment. The difference was trivial: three hostages would probably serve to bring the raft people back if five would. As for himself and his warriors, they had little desire to survive if they could not bring some of their clansfolk with them, some women at least to continue the people. He himself would willingly stay and let another ride the canoe in his stead, but he was the

leader, and he was Quick Spirit; it was up to him to gain the help of the raft people if it could be done.

He nodded, then surprised the big Norski by reaching out a hand. They shook, and the raftsman was surprised at the hard strength of the smaller hand in his own beefy fist.

And with that handclasp, something changed in big Arvo Olassøn.

He turned to his men and gave more orders, as did Quick Spirit. Three warriors stepped from the semi-cricle, coming up to their leader. To one called Knife Lizard, the smallest of them all, he spoke only a few words. For the other two he had more: they were to run to the clan chief and tell him what had happened. The clan should come to the beach at once.

Meanwhile, one of the Norskuna had taken the stern of the canoe and pushed it the rest of the way into the little creek, hopping into the stern as he did so. Then, alone, he guided it down the current with a paddle; the creek was too shallow to carry the craft with more than one or two men. The whole mixed assemblage followed, the Dinneh warriors watching with great interest beneath their apparent stoicism.

Where the creek met the light surf, two of the Norskuna waded out a few steps, holding the canoe. Arvo turned to Quick Spirit and gestured at it. "You and that fella get in, sit on bottom."

For the briefest moment, Quick Spirit and Knife Lizard held back, staring as a small breaker raised, then dropped the canoe. Then, hiding their misgivings, they waded out to their knees with Arvo and one other, and the two warriors, gingerly in spite of themselves, stepped over the side and sat down. Two Norsku followed quickly, one from each side, into the front, to kneel instead of sitting, and took up paddles. Arvo and the fourth Norski pushed then, a few running steps, through another small breaker,

and jumped into the stern. Quick Spirit felt the craft settle deeper with their weight, and heard the cry of the warriors behind them on the shore, half shout and half groan. Paddles dug, and spray from another breaker wetted them. Apprehensively, he looked about him. They were under way.

It felt good! The apprehension fell away and he grinned, then licked some drops of spray from his lips. Salty! He dipped a hand over the side, catching a bit of sea in his palm and licking it. The sea was bad water; the Dinneh, desert people, knew about poisonous water holes. Now Quick Spirit understood why the raft people, living on a great water, sent men ashore to get water from a creek.

They were well beyond any breakers now, the canoe surging with the paddlers' powerful strokes. Then Quick Spirit heard a distant sound, a short pattern of them, the hooting of a signal horn, and he almost tried to stand up, twisting to look back. On the beach, the others were waving to their leader to come back.

Quick Spirit's eyes went to Arvo in the stern, digging hard with his paddle. "Back!" shouted Quick Spirit. "We go back! Saurons coming!"

The Norski straightened, his halted paddle dripping. "Canoe not hold more fellas," he said.

"All me people come to beach. Very many fellas and they woman, they chillun. 'Nuff they take rafts to water before Saurons come this place."

Arvo knelt dumbly for a moment, sandbagged by the two pieces of new information: the Saurons were near, and the damned landsmen had a whole clan coming! If they could get the rafts to the water, he could get all his men off the beach. He gave orders in his own tongue again. The dugout turned as one low swell let it down and the next lifted it, then the paddlers drove it toward the beach where it slid to a stop on rasping sand.

This time Quick Spirit moved with the speed of a threatened cat, splashing through ankle-deep backwash to his warriors. Arvo followed him out of the surf. "What place you people?" asked the Norski.

Quick Spirit pointed at the canyon. "Up that place. They come." He snapped an order, and one of his warriors sprinted away. "You hear horn? That me people." It sounded again. "Horn say enemy seen. That be Saurons. Me people leave fellas back to watch for Saurons. Some back fella him see Saurons, blow horn. 'Nother back fella hear, not so far, him blow horn. Horn we hear, it horn belong chief. Me people not so far, Saurons much more far. But Saurons coming."

Arvo chewed his lips for a moment, then, mostly in pidgin so the Indians would understand, snapped instructions to his men, who had pulled the canoe above the surf. Two stayed to pull it up the creek. The rest, with the warriors trotting beside them, ran to the four rafts and began to open and empty the big waterbags, throwing the empties into piles on the raft. The Apaches, seeing this, followed suit.

Arvo snapped more orders, and the men gave their full efforts to one of the rafts, leaving the others till the first was done. He frowned absently at the coarse deck matting beneath his feet. Though this raft was only a small section of the clan raft, and the logs were paperwood, it still was massively heavy. Could enough men take hold of it to drag it? They'd have to, he decided, untying the mouth of another waterbag, but the thought remained gnawing at the edge of his mind.

Also it irked him to dump the water. But he had no choice: the tide's edge was still more than half a kilometer away, its progress slow, and while he knew the Saurons only through the stories told around night fires, they were described as ruthless killers who ran faster than other men, had weapons which

shot arrowheads very fast and very straight, and killed at a distance farther than the strongest bow.

Arvo raised the heavy bag and felt the rush of water from it. Long ago his people had dwelt on the shore, going to sea only to fish and to haul. It was the demands of the Saurons for women and for fish, along with their general arrogances, that had caused the Norskuna to make the first sea rafts and leave, to dwell on the ocean in peace. That had been long ago, well before the time of the grandfathers of grandfathers.

Two rafts had been cleared and work begun on a third when the rest of the Lion Clan began to emerge from the canyon. The first out was a party of warriors, followed by muskylopes led by women and bearing children, or women big with child. Quick Spirit ran over to one of the newly arrived warriors, Sees Far, chief of the Lions, and talked urgently to him. The chief, a sinewy man of middle years, asked certain questions which Quick Spirit answered urgently. Sees Far nodded curtly, then began to bark orders to those around him.

Quickly the children and women were unloaded from the muskylopes. Light-footed warriors holding braided leather ropes led the ungainly muskylopes toward the rafts, other warriors following, and women. As more animals arrived, they, too, were dismounted, or in the case of unrideable bulls, unloaded. Within a few minutes, all of the clan's remaining twenty-six animals were attached to the seaward side of an unloaded raft by ropes of varying lengths. Makeshift harnesses and collars were used, left over from hoisting in the broken lands, to prevent the animals from choking when they pulled. Warriors, too, prepared to pull with shorter ropes over their shoulders. Other Indians braced themselves against the landward side, some with hurriedly cut pry poles.

The Norskuna, however, continued to unload a

third raft, all but Arvo, who braced a pry pole beneath a timber while wondering what had become of his authority. The foreign chief had taken over.

Then Sees Far shouted an order in the Dinneh tongue, stout sticks descended sharply on the flanks of muskylopes, and grunts emerged from human throats, Arvo's included. The raft moved. The sticks struck again, muscles strained; once more it moved. By now they knew they could do it, and beasts and men kept it moving almost continuously in a series of jerks, until halfway to the surf they paused to rest. But briefly. Then they pulled and pushed again till the muskylopes approached the surf.

Quick Spirit called to Sees Far, who shouted at the muskylopes to halt, and Arvo walked over to the two Apaches. "This 'nuff far?" asked the Apache.

Arvo nodded. " 'Nuff far," he said. Sees Far shouted to the warriors and women, and the humans and beasts, sweat-covered despite the breeze, went back to get a second raft. When they got to it, Sees Far noticed the stack of empty water skins on it, which added weight, and asked Quick Spirit about that. Quick Spirit repeated the question to Arvo, who explained that the waterskins were precious to the Norskuna; that on the ocean they must carry all their drinking water; that it was very far between places safe to land for more. And on the sea they could get no more bags. The chief scout nodded and turned to Sees Far.

"This great water is a great desert," he said to his chief, "for its water is poison. I have tasted it." And now he saw that many of the waterbags on the third raft had not been emptied, but piled on deck mats laid on the beach. He did not have to ask why. And when he took his rope over his shoulder to pull, he saw that now all the Norskuna, with their thick raftsmen muscles, were behind the raft with pry poles.

The second and third rafts seemed easier. When they came to the fourth raft, all of its waterbags were still on it, full, and the body of the dead lookout. But this raft too they moved, by sheer determination. By the time they reached the surf with it, the tide had reached the first three, each breaker sending water washing entirely around them. They had the muskylopes drag the fourth until the breakers nearly washed the animals' chests. Then Quick Spirit sent men with the muskyslopes to drag the mats of filled waterbags.

Now was a time for decision. Warriors sat on the rafts, and it was clear they would not give them up. Arvo looked glumly at them, then turned to Quick Spirit and Sees Far, and several of the chief's council who stood looking back at him.

"Now time you fellas got to say what fella go and what fella stay. But all me fellas go. We know how make rafts go to clan raft. What fellas you go?"

Sees Far called his council—Quick Spirit plus four other warriors—and briefly they conferred. Water surrounded the rafts now, though not yet enough to float them. The muskylopes were arriving with the filled waterbags, and men—warriors and Norsku—were loading the bags on the three rafts that had none.

"Children go," the chief announced loudly to his people. He'd already lost some of the younger on the trek and would not willingly leave any. "I will also name certain young women and certain young warriors, that more children may be born, and to teach the children in the ways of the Dinneh." He turned to Quick Spirit. "And Quick Spirit shall go, to council with the yellow hairs."

He looked around and began to name names, ten young men, twenty young women. When the young men and women had climbed on the rafts, the preadolescent children were handed up or climbed on

by themselves. Some were crying because their mothers were being left behind.

When the children were on board, the rafts still were not too crowded; Sees Far named more names, and some of the older survivors boarded. Then he scowled at Quick Spirit, who still stood in the surf wash. "And you! Now!" Reluctantly the scout climbed on a raft, feeling somehow traitorous for doing so, despite the logic of it.

The rafts were now packed with people, and several of the Norskuna were speaking concernedly to Arvo; the rafts were too crowded, they said. There was not even room to manhandle the small masts into place when the time came. And the rafts were starting to lift now with the breakers.

"You will have to manage," he answered, then turned to Sees Far. "You fellas go 'long beach that way," he said, pointing south. "Me fellas come back, get more you fellas."

If there is time, he added inwardly. *And if our council agrees*. He would do his best to convince them. But some would be angry that he brought even these, although he'd had little choice.

Then the warriors and women who would stay behind pushed the rafts, which dragged bottom between breakers for a little, while the Norsku seated their sculls between sculling posts, helped by the young adults among their passengers. Then the rafts were free, and warriors pushed until the water reached their chests; perhaps one in four of them could swim.

As the raftsmen sculled, the men in the surf waded back to the beach to watch the ungainly craft move slowly away, one towing the dugout by its side. One of the rafts had only Arvo to operate it, from among the Norskuna, for the lookout had been his partner. But his was the raft that Quick Spirit had climbed onto, and the Apache, watching him, had picked up

a scull when Arvo did, seated it, and was imitating the Norski's action with the second twelve-foot sweep.

Then Sees Far must have given another order, for all the Dinneh left behind began trotting toward the high tide line where their gear and weapons lay. The rafts were some two hundred meters offshore when, near the distant bluff, Arvo could see some of the Dinneh beginning to run south along the beach.

A minute later the Norski heard a distant inland sound, and looked at Quick Spirit. The brown man's expression almost didn't change; only the lips had tightened, very slightly. Another horn blast: the Saurons had been sighted farther along.

He shouted a command to the other rafts, then quickened his stroke with the scull. There was no way to make the rafts go fast, but they could make them go less slow.

It didn't take terribly long to reach the clan raft; it only seemed to. Masts struck, it lay sprawled, structured but flexible, some five kilometers offshore, held approximately in place by men working casually at sculls. Closer than five kilometers the raft's "skippari," her skipper, did not care to take her. If this unconscionable drought should break, a strong onshore breeze was distinctly possible, and that would mean hard work to keep from being driven shoreward.

The clan raft had been driven ashore once in a storm, when Skippari Janssøn was a little boy, and had broken up with a loss of much iron goods and other valuable material. Fortunately, that had been on an uninhabited island, one where paperwood grew, and rope vine. But many of their hand tools had been lost, and it had taken ten of Haven's long days, about thirty-six standard (Terran) days, to repair and rebuild, while the children had searched the beach and raked the shallows to recover what they could of the implements lost.

Actually, Hansi Janssøn would have preferred to have his raft at least two hundred kilometers out, beyond any reasonable likelihood of meeting land-based fishers or merchantmen, and especially corsairs. But the dry season had been much drier than usual at sea, and considerably longer. On the islands to which the Norskuna usually sent water parties, the streams had dried up, and the occasional water-holes they'd found were too small, too thick with algae, too fouled by animals. They'd had to come to the mainland to seek it, and traveling on short water rations at that.

No, the skippari did not like this proximity, and looked forward to loading the waterbags and leaving. Now and again he glanced at Cats-Eye's slow progress up the sky. About the time the glowing gas giant reached the meridian, the rafts would float. After that it would not be long.

His musing was interrupted by a shout. A lad doing lookout on the maerstoppi, the masthead, called that the water rafts were coming, which was hard to believe; they should still be high and dry. But other boys quickly scaled masts too, to peer and point, so there could be no question, and the skippari sent a dugout to meet the water-rafts. Swiftly the canoe returned, the paddlers digging hard, and in it was Arvo Olassøn, in place of one of the canoe's original paddlers. When it had come alongside, Olassøn had scrambled quickly aboard the clan raft, where Skippari Janssøn had been joined at the edge by Stamchef (clan leader) Oska Egolfssøn and two of the "*størsmennu*"—the clan council.

"How have you come back so early?" asked Janssøn.

"Saurons were coming to the beach, sooner than the tide. And there were *landmennu* there, who dragged the rafts to water for us."

"*Landmennu!*?" The stamchef's mouth was slightly open in his astonishment. "But the scouts we sent

ashore said there was no sign of people there! And what *landmennu* are they that would help?"

Arvo's stomach tightened; now, he thought, the trouble would begin. "They call themselves 'Dinneh,' " he answered. "You will meet some of them soon. We have their children on the rafts, and some of their young women. And a few of their men and their old. The Saurons were following them to kill them, had been following them for more than five days [Haven's nearly 87-hour days—about twenty Terran days]. And the Dinneh men, after helping us drag the rafts to the water, insisted we save at least these few from the Saurons, who will kill all the rest when they catch them."

Stamchef Egolfssøn and the listening størsmennu stared at Arvo Olassøn, while Skippari Janssøn bunched blond brows above blue eyes.

"You are bringing foreigners, *landmennu*, to the clan raft?" Egolfssøn said incredulously. Such a thing was utterly unprecedented. And unthinkable. To the raft clans, *landmennu* had long meant trouble. They included the Saurons, of course, but also others told of in the rich and colorful oral tradition of the Norskuna. And the corsairs, who had decimated more than one raft clan in slave-raids.

Even those Norskuna who, after the exodus from the continent, had settled as farmer/fisherfolk on the green island of Nyttheim, were considered *landmennska* foreigners, and thought poorly of. It was they the raft clans visited to trade with occasionally—but no more often than necessary.

The hard feelings had begun at once, those generations ago, when some of the people had chosen to settle ashore. For the choice had split families: wives had reluctantly followed husbands, leaving parents; or wives had left husbands; or . . . While on almost every trading visit, one or a few of the younger raft folk would run away to live a life ashore, and it was

scarce consolation that an occasional Norsk *landmani*, struck by the idea of raft life, or perhaps by a raft girl, was accepted by the raft.

And their kin ashore had an advantage over the raft clans. For with the ore-bearing surface formation they had found in the hills of Nyttheim, the furnaces they had built, their clever but greedy ironsmiths, their water-driven sawmills, they had what the raft folk needed very much. But what the raft folk had to exchange—fish—the Norska *landmennu* caught for themselves.

So the exchange seemed always unfair to the raft clans: bales of dried but delicate coldwater laex, which they must sail far to catch, in trade for a score of planks; bales of hard-to-find sprotfisku from the distant coral reefs for a few bundles of iron rods to be smithed, a simple sheet of iron on which to set a stove, and maybe a kettle or two. And the prices for grain and vegetables were as bad. Thus the raft folk looked on their *landmennska* cousins as extortionists and cheats, and at other landsfolk as actual threats.

And now this Olassøn was bringing four water rafts full of *landmennu*, who would not even speak the language!

"They cannot stay!" the stamchef said.

Arvo Olassøn glared at him, a thing startling in itself. "If you insist on that," said Olassøn, "I will ask for a *størsmotti*—a *folkmotti* if necessary. It was the Dinneh who dragged our rafts to water before the Saurons could come."

Slowly the indignation drained from the stamchef. The young man had the right to both of those: *størsmotti* and *folkmotti*. In such a matter, a meeting of the council, a *størsmotti*, was his for the asking, without risk. But for a common *flottkarli*, an ordinary citizen, to demand a folk meeting in an effort to overrule the council—if that went against Olassøn, then Olassøn would be shunned. And on the raft, in

those narrow confines, that was an intolerable punishment.

Clearly the young man must feel that those foreigners were deserving of sanctuary. But to receive them on the clan raft . . . ? Impossible.

"Well," said the stamchef, "I suppose these people must know Angli, else you would not know what you do of them. I will speak with them. But you—remember the cost to you of a *folkmotti*, should it go against you, which it surely would."

He moved as if to turn, to walk away, but Olassøn spoke again, stopping him. What Olasson had to say, he felt, should not wait for the water rafts. "*Min Herri,*" he said respectfully, "Torval Benssøn is dead."

"What! How?"

The young man told him how the sentinel had died, stressing the peaceful approach of Quick Spirit. The stamchef was not as upset as Olassøn had feared. Benssøn had been a blusterer, had as a child even been something of a bully, although he'd been broken of that. He was a kind neither frequent nor welcome in a raft clan, where people live close, and he probably would have shot the *landmani*. But still he'd been one of theirs, and now was killed by the hand of the foreigner, maybe even one of those coming on the water rafts.

Oska Egolfssøn turned away tight-mouthed. He did not want to say anything to Olassøn that he might later regret; the young *flottkarli* had been his protege, whom he'd thought of as one day becoming a *størsmani*, possibly even stamchef. And he reminded himself as he walked away that it was no fault of Olassøn's that Torval Benssøn was dead. Even, he admitted to himself, the foreigners seemed not severely culpable.

Walking to a nearby shed, the stamchef climbed atop it to see what he could of the human cargo on the rafts, still the better part of a kilometer distant.

They were covered with people. Shaking his head, he climbed back down.

What Arvo Olassøn had told of the happenings ashore had swiftly spread. So when the water rafts arrived, virtually every member of the raft clan was on hand to see the foreigners. The raft folk were markedly quiet at the sight of such dark people. Not that they weren't themselves sunbrowned, but many of the desert-dwelling Apaches were tanned nearly black. And although no few of the Dinneh had brown hair, an occasional child verging on sandy blond, the hair of most was very dark, even raven black. And all wore it long, including the men.

There was also interest in the Dinneh physique. Most of the warriors were barrel-chested, but their sinewy limbs were mostly more slender than those of the raftsmen, especially now after weeks on the trail, fleeing the Saurons.

For their part, the Indians felt utterly exposed and vulnerable. This was another people's territory, a medium utterly foreign and unknown to them, only a few could swim at all, and the strangers far outnumbered them. And the great clan raft itself was intimidating. The small rafts rode about as high—they were of course sections of it—but just now they were free-floating, and moved differently on the coastal swell. Leads would open between the clan raft and their own, then close with a heavy bump.

And the edge of the clan raft was almost solid with the large foreigners.

Thus the Apaches did not move from the water rafts until Arvo Olassøn told them to. Then a few of the Norskuna reached out hands to help, taking first the smaller children. In a few minutes all the Dinneh were across.

Only when the rafts were mostly cleared did Oska Egolfssøn realize that but two of them bore filled

waterbags. The muscles in his strong jaw tightened, for this upset him more than the death of Benssøn. His people had been on short water rations for days, had run very low on the vital fluid. Now his water party had returned with less than half what they should have brought, and dozens of new people to help drink it.

But the time to speak of these things was in meeting. Now he voiced only orders: the *størsmennu* should gather in the privacy of the *størshusi*, the council house, along with Arvo Olassøn and the chief of the foreigners. He turned and walked away between the low, dowel-fastened wooden dwellings, sheds, and work shops which, along with drying racks, strewed most sections of the great raft.

He had taken his place in the *størshusi* when the others arrived, and after a stern glance at Olassøn, his eyes went to the foreigner. Nothing was said until the others were seated.

"You talk Angli?" he asked.

Quick Spirit nodded. "Me talk Angli. All people on land talk Angli; Saurons make talk Angli."

Oska Egolfssøn looked then at Olassøn, still talking "Angli"—pidgin—so the foreigner could follow what was said. "Why you fellas not bring more water?" he demanded. "You there 'nuff long, bring very much water."

"Water make rafts too much heavy, very hard drag so heavy raft. Us much hurry, Saurons come."

The Saurons again. Oska Egolfssøn pursed his lips, preparing to speak, but Olassøn wasn't done. He gestured with his head to the Apache. "This fella name Quick Spirit. The rest him people go south now, 'long shore. Saurons come after, mebbe catch. If us send more rafts, mebbe save him people from Saurons—fellas, women. No save, Saurons kill. If us gonna save 'em, us gotta hurry, not sit talk-talk long time."

The stamchef flushed. It was not this young man's place to tell him to hurry. He replied in their own language, in which he could express himself more exactly. "There are things to ask before we decide. How many would die if you hadn't been there? All of them, apparently. We have already saved many of his people. And we have no room for more on the raft. Also we would have to feed them." He paused. "And we don't have water for any more; we will be hard pressed even for these."

Somewhat to Egolfssøn's embarrassment, Olassøn interpreted his words for the foreigner. The brown man's expression did not change, and he made neither comment nor sign. Then Olassøn turned to his chief.

"*Min Besta Høyherri,*" he said, using the ceremonial term of highest respect, "what you have said is all true. But let us save the rest of this people if we can! If we were in their situation, surely we'd hope they would save us. Can we not at least try? In the old days, in the time of the valley wars, the Norskuna had heroes. Their deeds are recited around the night fires. Surely the rescue of these people would be another for our grandchildren to tell theirs.

"Our people can be crowded for a little, and with the water we have brought back, if we ration it . . . The rains are already overdue, and surely they will not hold off much longer. Ask the people if they are willing. Now, while there may still be a chance."

The stamchef shook his head slowly. The sagas included also stories of the Norskuna's experience of the Saurons, and little of that was even remotely heroic. It would be sweet to take away the Saurons' prey, but there were certain hard realities.

"You ask us to trust that the rains will come soon," he said, "and that is not wise. And even if we had more water . . . I do not criticize you for bringing back so little; I understand now why you couldn't.

But the fact remains that we are short of it. Also . . ." He turned to Quick Spirit. "How many you people—fella, women, *bahnu* . . . chillun?"

"All mebbe three hundred. Mebbe three hundred twenty."

Oska Egolfssøn pursed his lips, unconsciously shaking his head. His own clan numbered, at last count, four hundred thirty-eight. Three hundred *landmennu* would more than crowd them; they would constitute a danger. But before he could say it, Arvo Olassøn spoke again, almost as if he'd read his stamchef's mind.

"*Min Besta Høyherri*, the Dinneh do not know how to sail the raft, or handle it at all. They do not know the ways of the sea. Did you not see how they looked about them, as if afraid that the sea would eat them? They would never try to take over the raft.

"Ask the people if they are willing to be crowded. And if they are willing to have water rationed again. Ask if they wish to show that the Norskuna can still do great acts. Ask now, while there may still be time. The chance will soon pass. We can . . ."

A *størsmani*, Matts Jenssøn, interrupted. "Did you see any Saurons? How do you know the Saurons were coming?" He stared hard at Olassøn. "You have taken the word of these *landmennu* for it! The Saurons don't chase anyone for five days; they catch them and kill them long before five days. Those people lied; they fooled you! They have some plot. . . ."

"No," interrupted Egolfssøn, "that is improbable. They would not have sent all their children and so many women, with so few fighting men, unless they were in great danger."

He shifted his big body on the high seat. "The *størsmotti* will prepare to vote now," he said. Then, to Arvo and the Apache: "You two must leave the *størshusi*. I will tell you the decision."

Arvo Olassøn got up, Quick Spirit with him, and

they left. Outside, Olassøn said, "Boss fellas much soon done talk-talk. Them. . . ." He paused, having no Angli word for "vote," and finished lamely. "Them say yes or no much soon."

Quick Spirit nodded without speaking, not indifferent but resigned, and Arvo led him to a nearby bench, where they sat down to wait. Actually, the Apache had brought no expectations with him, and not much hope. Their wait was short; in less than five minutes, Oska Egolfssøn, followed by his *størsmennu*, ducked out of the *størshusi*. The stamchef, with Skippari Janssøn, came over to Olassøn.

"The vote was three to three. Therefore, this is what I will do. I am calling a *folksmotti* to vote on the issue; it will be when Cats-Eye is there." He pointed up at a meridian about two hours away. "Meanwhile we will set sail southward* while manning the sweeps, and approach nearer to shore, so that, should the vote be favorable, we will not have far to go. I will also send canoes out to see what is happening. While we are doing those things, the *størsmennu* can talk on the matter to the people, who will of course talk to each other." He pointed at the sky again. "Then, when Cats-Eye is there, we will learn what we must do."

Sees Far had just slung his pack onto his back and turned to look at the diminishing water rafts when he heard the far off horn hoot. The distance, he thought, might be a kilometer, but the horn would be passing on the signal from watchers farther back.

*Due to Haven's slow axial rotation, its Coriolus Force is much weaker than on many planets. Thus the prevailing winds are largely north or south, depending on latitude and, in the equatorial zone, season. At the location of the clan raft, about two degrees north latitude, with Byers' Sun about four degrees south latitude on that date, the prevailing surface winds were northerly, often with an on-shore vector during the long mornings and an off-shore vector at night.

But Saurons were swift.

At once he had shouted orders. Eight of the older warriors, again men who could no longer run so fast, separated from the group and disappeared into the jungle to set ambushes. Like the watchers, these men would almost surely be killed. Sees Far had no illusions that eight men with bows would kill many Saurons; considering Sauron senses, reflexes, torso armor, and especially weapons, the ambushers would do well to kill two or three. Their purpose was more to distract, delay, buy a little time.

The rest of the people began to hurry, most loping southward along the beach, the pregnant and some of the other women scrambling or being helped onto muskylopes. Sees Far himself was rather old for Haven—forty-seven years in Terran terms. But considering the Haven ecology, and particularly the chemistry of its desert waters, he was in unusually good health for his age, marvelously trail-toughened, and in his youth had been known as much for his speed as his eyesight. And as clan chief, he belonged near the front of the column, so he speeded up accordingly to get there.

For a little while now they might excel the Saurons in speed, for the beach was level and unobstructed, and its sand yet firm from the long night's dew, while the Saurons would still be trotting slowly among the boulders and fallen trees that littered the canyon. But when the Saurons reached the beach, a footrace would begin that the Lion Clan could only lose, and that fairly quickly, unless something intervened.

Nor could those on muskylopes long outspeed a Sauron. Even the better distance runners among the Dinneh, though initially left in the dust, could catch and pass a rider over the course of perhaps two days. And these muskylopes all carried more than one rider.

Nor did the chief have any illusions about the raft

people coming to rescue them. But until his people were dead, they would try to save themselves, in flight and then in battle. The adolescents were the final hope for a continuance of the people. When battle was imminent, they were to take the muskylopes and run them to collapse, then scatter into the jungle in mated pairs. Perhaps the hunting Saurons would overlook some or decide they were not worth the time and trouble. But that was problematical, a hope rather than an expectation.

Occasionally the chief took a hard piece of jerky from his belt pouch and bit off a piece, running steadily as he chewed. When he had mastered the tough dry meat, he slowed enough to take a swallow of water from the section of boiled-out muskylope gut which, slung over his shoulder, served as canteen.

He was grateful to the north breeze, which cooled him, and thought his thanks to it.

With the passage of one hour and then another, the tide continued to rise, somewhat narrowing the beach. In places, Sees Far could see that, at its peak, the water reached the bluffs. By now the Saurons, too, would probably be on the beach, coming swiftly behind, closing the gap.

The coast, remarkably regular here, began to curve westward, and bluffs gave way to progressively gentler, jungled hills. The Dinneh waded a small, slow-flowing river that came to their chests, their armpits, the clan's surer swimmers crossing first to test the depth, dragging ropes with them to help the smaller cross without being drowned. It was a short break from running, but briefly it slowed them.

So for a little they trotted faster than they had, to make it up.

As runners, Sees Far's people were less inferior to the Saurons than he knew. The Dinneh policy of genetic infusion from the Saurons had had more influence than they'd realized. No people of, say, nine-

teenth or twentieth century Terra were as genetically gifted, physically, as these descendants of the White River and San Carlos and Navajo Apache. And though the Saurons gained steadily on them now, the gaining was not as fast as Sees Far believed.

But not all of the Dinneh were warriors, nor all the warriors young, and the sand, drying in the sun, was beginning to be looser, harder to run on. Some of his people had begun to lag. Perhaps, thought Sees Far, it was time to slow for a bit, to rest by slowing to an easy jog.

It was then that someone shouted, and the old chief turned to look. An arm was pointing, and there, driven by sails and paddles, were three canoes, not more than three hundred meters away. He had not seen them, had not been looking seaward, hopeward. Sees Far ordered the slowdown and, waving the others on, himself angled toward the water's edge and slowed to a walk. One canoe changed direction and slanted to meet him.

As Sees Far watched, he could make out other sails far off, out to sea and farther back, and he felt a cautious quickening of hope. Looking back along the beach then with his Sauron-enhanced vision, he also saw, minute in the distance, what could only be Saurons, pursuing. The canoe came in on one of the small breakers, and grounded, the paddlers jumping out as it did so, to pull it farther up on the sand. He recognized one of them as a man who'd been with the rafts.

"Rafts come!" the man said urgently. "You fellas hurry, that place!" He pointed at a headland. "Go in water that place, rafts take you fellas 'way!"

Then he pointed back in the direction of the pursuing Saurons; his eyes too, though unenhanced, saw far. "Me think them fellas Saurons, run fast. You fellas gotta run fast too."

Sees Far nodded but said nothing for a moment.

His eyes measured the distance to the Saurons, then to the headland, and he estimated speeds. Again he nodded; he knew what he needed to do next.

"Me fellas, them be that place for rafts," he answered. The chief reached out, as Quick Spirit had to Arvo, and gripped the Norksi's beefy hand before turning to lope off after his people. The Norski stared after him for just a moment before turning to push the dugout back into the surf. He was glad he had voted as he had.

As Lieutenant Shtenuk loped tirelessly along the beach, his Sauron eyes had picked out the canoes, had even seen one land, seemingly to contact the Dinneh. He didn't know what that was all about, but supposed that the canoe people were responsible for the disturbed beach where the canyon emerged from the hills.

Still, what could primitive fishermen do that would make a difference?

He had not taken the time to examine the marks, had assumed they'd been made independent of the Dinneh, who then had simply paused to look them over. More pertinent to his mission, he'd thought, were the tracks of the fleeing Dinneh leading southward along the beach. Without stopping, he'd led his platoon on their trail. Later, near the horizon, he had seen—something. From his sea-level viewpoint there had been small sails and something low in the water, but it did not seem significant. Coastal fishermen.

And finally there was something he'd failed entirely to notice—a number of Dinneh warriors had, individually, slanted a few strides to the jungle's edge, to backtrack in the cover of its fringe, out of sight even to Sauron eyes at that distance.

A kilometer ahead he could see a river emerge from the jungle, carrying brown water out into the

ocean. To the lieutenant the river was no problem. Nor was the fact that his platoon was now sixteen short of its normal complement of sixty-four. Eleven of his losses had come in the hard-fought march up the long and rugged defile that led to the desert basin which had constituted the Dinneh's territory. The several skirmishes and ambushes since then had cost him only five more. He and his men wore light torso armor, sufficient to stop arrows. You were all right unless you took one in the face or neck, or in a limb. In that case, you were in trouble; the damned Dinneh had coated their arrowheads with something quick and nasty.

He didn't think of them by the name "Dinneh," of course. To the Saurons, except for a few of those who'd been stationed among the Dinneh before the revolt, they were referred to simply as "cattle," like the rest of Haven's non-Sauron populations.

The cattle would no doubt fight when cornered. But Shtenuk took no particular pleasure from the thought; they were too few, their warriors outnumbering his men only perhaps two or three to one. And they would have seen him coming by now—even cattle could see that well. They were probably shitting in their pants.

He'd have preferred to be chasing a much larger force, or perhaps approaching them in some mountain fastness—something to make things interesting. Like the fight up the defile to the basin; that had been more worth a soldier's time!

The Saurons had been spoiled by centuries of dominance—of few challenges in their zone of interest. Thus Shtenuk's mind was in part on these other matters, and not totally on business. Had there been a cyborg with his platoon, Shtenuk would have been more alert, or been relieved of command by it, or perhaps summarily executed for poor attitude on a combat mission. But the cyborgs had declined in

numbers over the centuries; only three had accompanied the entire battalion on this campaign. Of course, cyborgs were seldom really necessary in battle on this world. They served their function now mainly in training Sauron youth to the required keen edge of physical and military prowess. Or as keen as you could get without fighting worthwhile enemies.

Shtenuk had reviewed the old maps of this territory, had looked at the map for this particular quadrangle only that morning while he ate. The shore here curved westward into a small and narrow peninsula. But the cattle wouldn't know it was a peninsula. To them it could easily be simply a curve in the coastline.

He should overtake them somewhat before they reached the point, he decided, even allowing that these particular cattle had shown themselves surprisingly tough and fast. So, depending on how much energy they had in reserve, they might conceivably reach the point first. In that case he would send a squad through the jungle to cut them off—waylay them when they fled down the beach on the peninsula's other side. He smiled inwardly at the prospect. It would be amusing to let them reach the point, just to do that, and salvage something entertaining out of this pursuit. But Shtenuk would never do something as unprofessional as that. A Sauron always closed a pursuit with utmost dispatch, holding back only for good operational reasons.

His three-point men had reached the river bank and paused momentarily to scan the other side. The shore here was indented, scoured by the river's current, and the tide had reached within twenty meters of the jungle. Crossing the river, they'd be relatively vulnerable to ambushers in the undergrowth. Seeing none, they started across, rifles held overhead, the water rising to their chests, then emerged from the

other side. The rest of the platoon prepared to follow them by squads.

The first squad was past the middle, up almost to their necks, the second starting watchfully down the bank, when the arrows began to fly. The first squad disappeared at once, submerging. The second ducked back into cover, but three had been hit and collapsed in the brush to die. The third and fourth squads knelt in the underbrush where they'd taken cover at the first arrow shot, and immediately began to fire their rifles into the growth on the other side—aimed fire at any movement, into any favorable cover, their practiced hands operating the bolts with sufficient speed that they could smell hot wood on the forepiece. Within a minute, their gatling gun had been set up and began to rake the other side systematically. Then Shtenuk saw the heads of the the first squad emerge one by one under the overhanging growth of brush along the far bank. As far as he could tell, only one of them was missing. He shouted the order to cease fire.

From where he lay now, he couldn't see the point men. But in the instant before diving into the jungle, he'd glimpsed two of the three lying on the beach with arrows in them. Presumably the third had made it into the jungle, but it would be surprising if he'd made it unwounded.

Shit, he told himself, not angrily, *things are getting interesting after all*.

There was no sign of further enemy activity. They could easily all have been hit and out of action now, for the Sauron rifleman used his weapon with an accuracy grown of inborn talent and long practice, while their gatling gun pumped out bullets at a sustained rate of three per second. Or the display of firepower might simply have shocked the survivors into stunned stillness. If so, his men would probably

see signs of their movement when they tried to crawl away.

Shtenuk never missed the firepower the Saurons had brought to Haven centuries earlier. The old weapons had long since worn out, and among the Saurons, with their deliberately now-oriented culture, the past was barely even folklore. The systems of the fugitive transport which, crippled, had landed them there, had early ceased to function. And Sauron armorers had neither the facilities nor the precision engineering skills to tool parts for things like automatic rifles.

The basic problem was that, through selection, indoctrination, and training, the Sauron culture had culled, quashed, and failed to develop the potentially skilled engineer in its single-minded emphasis on the skilled and utter warrior. Like the smilodon, the Sauron was a highly specialized killer.

Of course, genus *Smilodon,* despite or because of specialization, had lasted some thirty million years, to succumb eventually to primitive man. So far the Saurons had shown no sign of succumbing. Personal warrior skills, highly flexible and foot-mobile combat tactics, unit coordination, and ruthlessness, all intensively drilled, along with rifles, grenades, and the primitive gatling gun, had long been more than adequate—with only occasional help from pack artillery.

Now Shtenuk shouted harsh Sauron gutturals and watched the first squad crawl out of the water into the underbrush on the other side. Then he sent the second squad out of the vegetation on this side, down the slick bank into the water, also to submerge. No more arrows flew. The third squad he sent through the jungle to cross upstream a hundred meters, just in case. He'd hold the fourth here as a reserve, to lay down aimed rifle fire if needed. It seemed highly unlikely that it would be.

A shout reached him, via a relay man on the other side. They'd found a body, then another, and a third and fourth. The second squad was crawling out of the water now, and upstream, Sergeant Burkha's third squad should be crossing or about to cross.

It was precisely then that a brief flurry of shooting occurred in the jungle on the other side, followed by a pause and more shots. Meanwhile, the second squad had disappeared, melted into the thick vegetation. Shortly two more flurries of gunfire were heard, and a minute later another. Moments later there were two more. After that it was quiet until Sergeant Bezhut, in charge of the first squad, sent a runner to report. One of the cattle had shot at them with a rifle, and a private had been lungshot. They'd returned the fire, but hadn't seen the target, and as far as they could tell, hadn't hit anyone. They'd quickly found his trail and begun to follow him. Also at once Bezhut had sent men to the beach, assuming that the enemy had gotten his rifle from the point men, who presumably had been killed in the ambush. They would track from there.

Eventually the situation sorted itself out. The enemy body count came to nine. Corporal Langruf was dead and the lungshot man was dying. All rifles had been recovered. Two more enemy had fled, separately, one of them leaving blood flecks. He'd let them go, Shtenuk decided; this had already taken too long.

He gave the order to reassemble at once on the beach beside the river, then took the fourth squad across and waited briefly for the third squad to get there. Meanwhile, the fourth squad had broken down the gatling gun into its constituent parts for carrying, a twelve-second job done before crossing, and the lungshot man had been given the coup de grace. The Sauron dead came to eight.

Shtenuk hated to leave Sauron bodies for vermin

to feed on, but he'd have to for now. They'd carry them to the beach later and make a funeral pyre for them, after they'd caught and finished off the cattle.

While he waited, the lieutenant reviewed the skirmish. They'd been delayed for more than twelve minutes, which, though Shtenuk didn't realize it, was all that Sees Far had intended the action for, and died for.

The Sauron platoon reassembled and started off again on the trail of the cattle. But now it had ceased to be a recreation for them, a wilderness hunting expedition. Sauron troops were proud as well as ruthless, fearless, and unmatched in competence. They resented Saurons killed, and also, each of them felt embarrassed by losing eight to an ambush.

Now, as they loped along the beach, the new point men were absolutely alert to any sign of movement in the jungle's edge. And of course, anyone any distance back from the edge would be in no position to shoot arrows at them. They could only move in after the Saurons were past, to shoot from the rear. To guard against that, Shtenuk had assigned four men as a rear guard, two of them loping along at the very edge of the jungle, finger in the trigger guard, thumb on the safety. Two others followed a little farther back and near the gentle surf, eyes left.

There was, of course, some wind movement of the edge vegetation, but trained Sauron eyes would recognize the difference.

These precautions slowed their pace from about three minutes per kilometer to something approaching four. And while they still gained steadily, it was clear to Shtenuk now that the cattle would reach the point before he caught them. So before then he would have two squads shortcut across the peninsula and waylay them on the other side after all—take them between the guns in front and those behind.

* * *

When the shooting stopped from across the river, Swift Feet and his grandfather had gotten to their feet. But not Laughing Man. He lay dead. One of the three Sauron point men, though shot in the neck, had snapped off a shot as he'd darted into the jungle and hit the ground. Like Laughing Man, the Sauron would never get up, and it was to him that Swift Feet and his grandfather had gone. His grandfather had handed Swift Feet the pistol and belt, keeping the rifle for himself.

He also gave the youth some hurried instructions, then Swift Feet had left, running the first five hundred meters through jungle, dodging trees, ducking lianas, hurdling fallen trunks. For one so fleet, this was slow going. But it was important that he escape unseen, if possible, for even he could not long outrun a Sauron if it came to a footrace.

When he'd come out on the beach again, there'd been another flurry of shooting, and briefly he'd ducked back into cover. But it repeated when he was out of sight, so he decided it was not at him, and came out onto the beach again where he could run faster. Over the next few minutes he heard gunfire several more times, increasingly distant as he sped from the site.

Only once did he slow to look back, some two kilometers beyond the river, and his keen eyes, with their hawk-like magnifying central vision, saw no sign of Saurons on the beach. As for himself, though he kept to the heavily-tracked trail of his people, he kept to that part of it closest to the jungle fringe, where the visual background of tangled vegetation would render a single runner next to invisible at a distance.

He did not slow to examine the handgun or cartridge belt. He was already familiar with Sauron handguns, crude, heavy, long-barreled revolvers whose cylinder advanced by thumbing. Every Lion warrior had

at least a little familiarity, for man and boy, they had never failed to observe when Saurons among them had used or handled arms, as they often did to impress the people.

But Swift Feet had a closer familiarity. His father had been a Sauron officer assigned to the Dinneh, and his mother, too, carried Sauron genes. This ancestry was reflected in Swift Feet's brown hair and blue eyes, the lighter tan of his skin, and, more importantly, in his Sauron-like strength and speed and quickness of reflexes. And the fifth-from-last Sauron officer to live with the Lion Clan (the assignment was for one standard Terran year) had been less arrogant than most; he had been friendly to the chief's grandson, who looked so much like a Sauron child. Grinning, the man had shown him his pistol, even shown him how it worked, and let him touch it though not hold it.

Oska Egolfssøn could work a scull like any other Norski, though he didn't do nearly as much of it as he once had—enough to keep his strength. A stamchef acted as referee, consultant, and occasional judge, and he was also the raft's executive director. However, all these tasks together were only moderately time-consuming, and in the populist societies of the raft clans, a stamchef was expected to stay moderately busy like everyone else, putting his hand to ordinary duties.

Just now he was sculling one of the section rafts—a module, so to speak, calved off like seven others from the clan raft to serve not for fetching water but for rescue. And he was not sculling today because it was expected of him. It wasn't.

But he'd laid his reputation on the line when he spoke in support of Arvo Olassøn's proposal. Despite the clan wives' captivation by the smaller Dinneh children, and the appeal to old Norsk heroism, the

practical and conservative raftsmen would not have approved the rescue proposal without his support of it. And even that would not have sufficed without his last minute solution for what to do with the foreigners. With that, the margin of approval had been substantial.

Beyond that, no fewer than twenty-four scullsmen were placing their lives at unusual risk. For the mission required eight rafts, and this time each raft had three sculling posts manned.

So he felt a sharper responsibility, and almost compelled to take an active role in the rescue mission. Besides, he ascribed to the viewpoint that the best way to see something difficult done right was to do it or direct it yourself, or more often, simply be on hand and available.

And beyond that, it felt—exciting. Once he'd decided to support the mission, juices flowed in him that he hadn't felt since boyhood. Excitement seldom came his way.

Peering southeastward across light-spangled, jade green water, he could see not only the point for which he steered, but a distant train of people running toward it along the beach. The sight amazed him: his own people never ran farther than a few steps. Even the Nyttheim Norskuna, living on land, didn't run such distances, so far as he knew. No wonder the Dinneh warriors had such sinewy legs!

He continued the powerful movements of his heavy torso and legs, thick callused hands gripping the sweep solidly, his practiced mind judging wind and currents without conscious attention. He knew exactly where he wanted to go, and together his body and subconscious constituted a marvelously sophisticated servo-mechanism to carry out command intention. Meanwhile, he kept track of the seven rafts that followed him, and the three dugouts, sails furled

now, that sat lightly grounded on the still distant point.

Only with a telescope—and they'd lost all but memory of such an instrument—could he have seen the smoothly running Saurons against the backdrop of jungle, but he did not doubt they were coming. A canoeman, Jøssi Mikkissøn, had seen them early on, had signalled word to him.

This was more than a simple race he'd gotten his little flotilla into, the stamchef told himself. For it would not be enough just to get off the shoal ahead of the Saurons. Quick Spirit had told him frankly that the Saurons had weapons which could kill across a distance much longer than arrow flight, and indeed, Norsk tradition said the same. So they needed to be well away before the Saurons got there. That's what made the peninsula's point essential as a loading place, or the shoal that was an underwater extension of it. Load there, raise sail, and the north wind, freshening now, would move even such clumsy craft quickly away from shore.

His sense of urgency surged, reinforced by fear, and he called out to the other rafts to hurry, then speeded the cadence of his sculling.

The people were still perhaps two kilometers ahead when Swift Feet, glancing back, spotted the distant file of Saurons coming. For him to continue running on the beach was to risk being seen. Perhaps, he thought as he entered the jungle, they had seen him already. But if he were them, he would be watching for another ambush, perhaps glancing at the fleeing clan now and then, if they could see them from that far, examining the intervening beach only occasionally, if at all.

Spying a large fallen tree not far within the jungle's edge, he went to it. He would lie behind it to attack, up where the trunk separated into thick branches

between which he could shoot. They would make him harder to see and give him some protection from bullets.

But first he would crouch where he could watch the Saurons coming.

Stationary now, Swift Feet watched them rapidly closing the gap. Then, to his surprise, about half of them left the beach, disappearing into the jungle, while the rest came on. For a moment he almost panicked and fled, for it seemed to him that they must have seen him, that the soldiers had gone into the jungle to flank him. But he rejected the thought: surely they would have come farther before they did that.

It would not be long now, so he took his ambush position and practiced sighting down the top of the long weapon—twenty-five centimeters, receiver and barrel. Both hands, the Sauron had told him; use the sight, *squeeze* the trigger. "But not you, little Dinneh," he'd added with a laugh. "Gun for Sauron only."

The Saurons were getting near, and Swift Feet released the safety. He would shoot the leader first, if he could recognize him. Not the man in front necessarily. In the tribute parties, the officers had worn shiny metal sunbursts or crossed metal swords on their collars; he would look for those. And shoot low, he reminded himself; Saurons wore torso armor.

The lieutenant was not more than fifty feet distant when Swift Feet squeezed the trigger, his front sight on Shtenuk's thighs, and the Sauron's momentum took him sliding along the sand. Swift Feet was startled by the revolver's recoil, but nonetheless remembered to thumb the cylinder ahead one click.

The soldiers had swerved, darting toward the jungle and the as yet unseen Swift Feet. But his reflexes were scarcely slower than theirs. Again he fired—once, twice, now with wrists and hands more firm, as a return flurry of rifle bullets slapped and sang in his

vicinity, some hitting the fallen tree. Yet he rose to his knees for better shots, snapping off two more quickly before three bullets struck him almost together, killing him instantly.

The Saurons crouched in the undergrowth for a moment, only their hard eyes moving, alert for any further enemy. After half a minute, one of them slowly stood, trigger finger ready, deliberately exposing himself to draw fire, but there was none. He slipped forward and found their attacker, whose feet would run no more.

Only one! thought Sergeant Bezhut. *These cattle are dangerous when they have guns!* But maybe there *was* another, lying low, waiting quietly for them to turn their backs. So he left the first squad there, rifles ready, fingers on triggers, eyes alert for any movement, and he himself took the second squad back onto the beach.

Shtenuk was dead, Bezhut found, a bloody hole in his chest. Swift Feet's first shot had been high, but the Saurons light torso armor was intended to stop arrows, not high velocity bullets. Another Sauron lay dead at the jungle's edge, while a third sat bleeding in the undergrowth, swearing now.

Bezhut ordered the first squad back onto the beach then, and they began to run again. But for the moment more slowly than before, albeit faster than any other human soldiers would have run. They were trying to see more deeply into the undergrowth now; an enemy with a gun might lay farther back from the beach than a bowman would, like the one they'd just killed.

The third and fourth squads had stopped dead in their tracks at the sound of shooting, and for a long moment Sergeant Burkha held them there with an upraised hand.

It was quiet again. All he could hear now was his

own heavy breathing and that of the others nearest him. The first and second squads couldn't be shooting up the cattle this soon; there must have been another ambush. And the fourth squad, with the gatling gun, was with him. The question was whether to continue or to go and back up the others. But he'd been given his orders, and the others could handle anything the cattle might try.

He waved his hand forward, and they began running through the jungle again, toward the other side of the narrow peninsula, where they would set up an ambush of their own.

Bezhut had seen the sails before, but thought them simply a fleet of canoes. They'd gotten a good look at some canoes a while earlier, and dismissed them as too small to be meaningful to them—curious coastal fisherman hanging about to see what was going on.

But now he realized that these new craft were larger, and moving toward the point, and it occurred to him that they might possibly intend to interfere. He shouted a sharp order, and his men speeded up.

The first of the Dinneh reached the ultimate point of land and, shouted on by canoemen, waded into the water. The first three rafts were waiting for them, sails down. Each was held more or less in place against the breeze by two scullsmen who, as the raft drifted into position, had quickly switched their sculls from the sculling posts at one end to those at the other. The third raftsman stood ready to hoist the sail again.

Gunfire sounded at a distance rearward, impelling stragglers to greater speed.

The water was hip deep to the warriors who reached the nearest raft, but its deck stood shoulder high, rising and falling gently. Quickly the first several were boosted aboard. Then, with help from above

and behind, Indians began to board en masse, while canoemen shouted and waved more to other rafts. Some Dinneh women were on muskylopes, two and even three to an animal, and the now nervous beasts were dragged and cudgeled by warriors out to a raft with their burdens.

The first raft was quickly loaded. Its scullmen lifted their sweeps from the sand while their partners hoisted the sail, and the clumsy craft began to move sluggishly ahead of the breeze, its crew shouting now at the crowding Indians to let them through with their sculls. A few Apaches had tried to pass it on the downwind side and found the raft pushing them ahead of it. Shouting, in some cases choking and sputtering, they were hauled aboard by others. One was overridden and drowned.

A fourth raft, its sail down too now, was being wind-pushed toward the mob; its scullsmen dug blades into the sand to stop. The second raft left with its load, and then the third, to the sound of renewed gunfire.

Sergeant Bezhut had abandoned any doubts about the intentions of the raftsmen, and himself leading, had increased the pursuit to a speed almost too fast to sustain. In another hundred meters they would commence firing. At that moment, the final ambush struck, while his men were straining, their attention on speed instead of the undergrowth. Arrows streaked, and several men fell while others felt the hard blows of arrows on torso armor. The remaining Saurons dispersed instantly, the several foremost hitting the sand, firing their rifles in the direction of the ambush, while those behind them darted for the jungle's edge. More arrows struck into and around the men on the sand as guns continued to slam, aimed now at seen targets, bullets ripping into the jungle. The arrows ceased. The Saurons who'd reached cover

quickly moved through the vegetation, weapons ready, occasionally firing. They found seven Dinneh dead, and five wounded whom they killed.

Sergeant Horsht of the second squad trotted back out onto the sand, saw Bezhut lying with an arrow in one eye, then looked along the beach again. He could not see the very point, for in the final four hundred meters the beach curved southwest, and the jungle, though scrubby there, screened it. But Horsht *knew* what had to be happening. He knew. With a sharp shout, he ordered his men on again. Those with a clear line of fire paused at will to shoot at the still-distant rafts standing off the shoal waiting for a place.

Bullets, their energy more or less spent, had thudded into the seventh and eighth rafts, but their crews hadn't realized what the sounds meant. The fourth raft was just beginning to move away, its scullsmen crowding their way through the pack of Indians when, on the seventh raft, starting now to move in, a raftsman went down, struck in the temple by a Sauron round.

Indians still were climbing onto the fifth and sixth rafts. It was a canoeman who realized what had happened, and what to do. Shouting, he waved the two off-lying rafts to move to the shoal, out of the line of fire. They did, farther out, and Indians breasted the water past the fifth and sixth to get to them.

A moment later, the Saurons appeared around the curve of the beach and slowed, the leaders emptying their magazines at the rafts and Indians less than a half kilometer away. People began to fall. The fifth raft, a scullsman down, swung slowly around, uncontrolled, and began to drift away, mostly loaded. The raftsman by the sail quickly raised it; one of the warriors had grabbed the fallen scullsman's sweep and placed it between two scull posts, then imitated

as best he could the actions of the other scullsman. The raftsmen on the sixth, swearing mightily for haste, held her there until she was pretty much loaded, then lifted their sculls. As they traded ends, the sail was raised and the raft moved away, the scullsmen quickly sculling for dear life. Then one of them fell too.

By now the Saurons were near enough for greater accuracy. On the seventh raft, both scullsmen went down and the sail up with the raft less than half loaded. One, not badly wounded, still gripped his scull, though, and got back up, cursing, to add his strength as the craft began to move downwind under fire. The eighth lost both scullsmen with not more than a dozen Indians aboard; the third raftsman raised the sail, then hit the deck among the prostrate Apaches as it too began to move away.

Fortunately, the first three rafts had taken on more than their share of the people, but still some thirty of the Dinneh were left in the water. Some began to swim after the rafts, some who'd never swum before and never would again. Most turned to wade toward the beach, trying for the scrub growth on the point.

Briefly, moving south ahead of the wind, the rafts were again out of the line of fire, all but the last picking up speed. Meanwhile the bowman in one canoe picked a fallen scull from the water, and the other paddlers started after the raft, digging hard, closing quickly on it. The man with the salvaged scull transferred to the derelict raft, swearing its prone crewman to his feet; together they manned their sculls and picked up speed.

But several of their dozen Indians aboard were dead or wounded.

The Saurons rounded the point, knelt, and began to fire again at the retreating rafts. Three of the rafts were within easy range, though their Indians were

mostly lying flat. On the hindmost raft the riflemen saw both scullsmen go down at once, presumably shot; they'd hardly have had time to hear the renewed gunfire and hit the deck deliberately. Several other men fell into the water in the first volleys of gunfire, as far ahead as the fourth raft. But all the remaining targets flattened themselves, providing low profiles, the hindmost shields for the rest. And the distance continued to widen. After emptying a pair of magazines each at the retreating rafts, a thin-lipped Sergeant Horsht ordered a cease fire; their ammunition was not inexhaustable.

The Sarons turned to the jungle; there still were the cattle who'd missed the rafts.

Epilogue

Time passed. Before the clan raft had headed for the mid-ocean reaches, another mission had gone to a mainland stream for water. This time canoes took in the empty water bags only two hours before high tide, and their crews worked rapidly, filling and piling them. Then the rafts came to quickly load and leave, minimizing the danger of shore attack.

Later, a corsair had seen the outward-bound clan raft and approached to examine it as a possible victim. But the lean and hungry ship had veered off and disappeared, no doubt because of the large number of armed males to be seen on the raft.

The Dinneh learned to eat fish and help catch them, pulling on nets and long hand lines, and to gather and cook the seaweed that floated here and there in beds larger than the rafts. And some of their women birthed children.

There had been no conflict between the two peoples. To some degree they tended to keep to themselves, and their leaders quickly handled such potential conflicts as occurred. The raft folk, used to living

together on a small floating island, had long since learned to handle trouble and its causes before they became a source of serious upsets.

But the Dinneh desired greatly to live ashore again in a land of their own, while the Norskuna wished to be what they considered uncrowded once more.

So when at last the forested bulk of Grønøy—"Green Island"—rose above the horizon, both Dinneh and Norshkuna went about grinning, one at the other as well as among themselves. The island was uninhabited; now it would be the country of the Dinneh, far from the landbound Saurons.

Two days later, the clan raft lay a few kilometers offshore while the Dinneh disembarked onto section rafts, taking with them a few bales of dried fish and seaweed, enough to start with. Nor would they depart alone. Besides the raft crews, who would return, four Norska men and their families went with the Dinneh—two with Norska wives and two with wives from among the Dinneh, for the Dinneh had a considerable surplus of women. The three older Norsku had been *landmennu* on Nyttheim; they had gone to the raft clan because they had fallen in love with raft girls. One knew the smelting of iron, and on an earlier visit to Grønøy claimed to have seen a vein of iron ore in a cliff. Another, since widowed, had been apprenticed to a millwright on Nyttheim, and on the raft had been a master smith. The third had been a farmer lad.

They were to teach the Dinneh what they knew—help them to make their own iron and to grow gardens. Just now, the warriors were more interested in the game to be hunted on Grønøy, but Quick Spirit, who had become chief of the Lion Clan, knew that here, where they could not trade for iron goods, some of the Dinneh must learn to do other things than hunt.

The raft clan, of course, looked forward hopefully

to trading with the Dinneh for the goods they could only get on land.

To the two clans involved—the clan of the Cliff Lion, and that of the raft—all this was a matter of getting along, of surviving as well as the circumstances allowed. Neither people realized consciously that what they had done and were doing would prove significant in the civilizing of Haven.

EDITOR'S INTRODUCTION TO:

SPACE TRANSPORTATION WITHOUT ROCKETS

Veteran readers of *Far Frontiers* are doubtless aware that we tend, as a first chop, to analyze virtually all questions in terms of their impact on personal liberty. Many times that first chop is all that's required. On Burning Issues of the Day from star wars to socialism, from rights of inheritance to rights of divorce, if you come down on the side of freedom you will seldom go wrong.

The ultimate freedom, the one from which all others flow, is the freedom to take a long walk. Absent that, sooner or later Meanies in Blue will come to put you in your proper box.

Alas, space flight as currently practiced does not include the long-walk option. Until we find a better way than chemical rockets, Space is basically a military venue with an ancillary role as a playtoy for scientists. In this article, the first of a series for us by Dr. Sheffield, we see how space flight may become very cheap indeed—cheap enough to free us from our independence on tired old Mother Earth.

—JPB

Space Transportation Without Rockets:

Beanstalks, Tethers, Launch Loops, and Indian Rope Tricks

Charles Sheffield

I. SCIENCE VERSUS TECHNOLOGY

Science and technology. We tend to use the words together, almost as though they are different faces of the same coin. But there are times when science tells us one thing and technology something strikingly different. This is certainly true when we look at the problem of moving bodies to space, from space, and in space.

First, the technology. The outstanding technological accomplishment of today's U.S. manned space program is the Space Shuttle. In the first minutes of the ascent phase the Shuttle consumes energy at the same rate as the whole of the United States. There are few sights more impressive than a Shuttle launch, and few manmade objects are noisier. The descent is much quieter—almost too quiet, because the Orbiter, lacking any powered flight capability, must get it right on the first try. But the whole round trip eats up a vast amount of energy.

Now let's look at what science tells us should be

possible. Back in 1773, Lagrange introduced the valuable concept of the *gravitational potential*. One of the first results that we learn in potential theory is this: *The work done carrying a test particle around a closed curve in a fixed potential field is zero*.

Now, around the Earth there is, to good accuracy, a fixed potential field. The only factors that are not represented by such a field to within a few parts in a million are the small perturbations due to the Sun and Moon, radiation pressure, atmospheric drag, and tesseral harmonics of the non-symmetric Earth.

Therefore, science tells us we ought to be able to send a test particle (such as a Space Shuttle, which on the scale of the Earth is no more than a particle) up to orbit, and back down to Earth, without doing any work.

Conclusion: We must be doing something wrong.

Notice that the theory says nothing at all about *how* to do it—it says only that the energy-free process is possible *in principle*. We need to look at *how*.

II. A THOUGHT EXPERIMENT

Let us first examine a purely hypothetical system, ignoring what we may term the "engineering details." (We will be doing a good deal of that. We are assuming the engineering capabilities of the 21st century, and we have every reason to expect that they will far exceed what is available to us today.)

Suppose that we have a large space station in geosynchronous equatorial orbit. Suppose that we have a long loop of thin, massless fishing line that runs all the way down to the surface of Earth, round a pulley there, and back up to another pulley on the space station (see Figure 1).

Attach a massive test particle to the line down on the surface. Now operate the pulley with an electric motor, to wind the particle up to the station. We will have to do work to accomplish this, against the gravi-

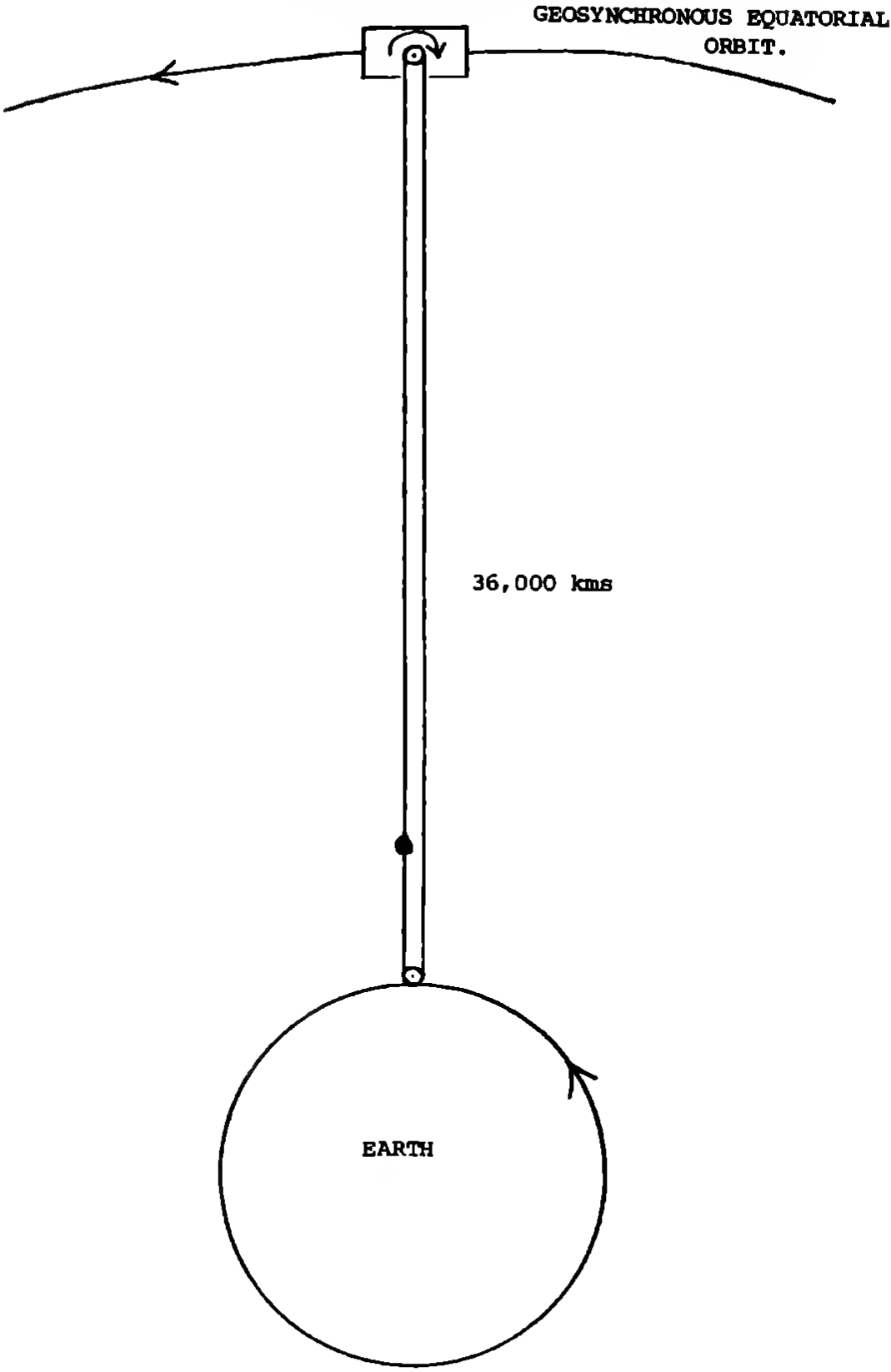


Figure 1: Space Fishing-line.

tational field of the Earth. Now operate the pulley system again and lower the particle back down. We have to *restrain* the test particle from falling. So we now can use the force produced by the particle to drive a generator attached to the upper pulley wheel. When the test particle arrives back on the surface of the Earth, we will have recovered all the energy that we expended in hoisting the particle to orbit.* The only losses are those produced by friction and the imperfect efficiency of our motors and generators that convert electrical energy to gravitational potential energy and back.

This fishing expedition may seem very much a scientific abstraction, irrelevant to the real world. But it may not be. We will return to it later.

Note that, by starting with a geosynchronous equatorial orbit, we are *geostationary* (in a fixed position relative to the Earth) and thus have to deal with only a static situation. If we start elsewhere, say in low Earth orbit, we have a much more complicated situation, because the upper end of the system is moving at several miles a second relative to the lower end.

At this point I would like to draw your attention to a little-known curiosity of the sf literature. It appeared in the August, 1932, issue of *Wonder Stories*. In that magazine was a story by A. Rowley Hilliard, entitled "The Space Coffin."

In this story, people are being kidnapped for ransom, from many different parts of the world, and no one can understand how they are able to disappear without trace. It turns out that they are being drugged and put in a box with a hook on the top of it. A grapnel from a low-Earth-orbit spacecraft then comes over the exact location and whips them away into

*If we use one pulley to raise the weight and the other to lower it, we have also found a highly efficient way to transfer energy from Earth to orbit, or orbit to Earth.

orbit. The author showed a commendable faith in future knowledge of dynamics and control, though he was apparently a little worried about the accelerations that the victims would experience—he mentions that the captives were held in the box by straps "attached to strong springs!"

If this idea sounds like fiction so wild that it is hardly worth discussing, let me assure you that something rather like this has been seriously proposed. We will discuss it later.

III. SPACE TETHERS

Apart from its unusual use, the device in "The Space Coffin" is nothing more than a *space tether*, the first such mention that I am aware of. And the tether idea is certainly not wild-eyed speculation. A tether is nothing more than a long string, connecting a satellite with a payload or another satellite. We will see the first tether missions from the Shuttle Orbiter in 1987 and 1988. An artist's conception of one of them, a joint Italian/U.S. experiment, is shown in Figure 2.

The first tether will be only 20 km long and will be extended upwards from the Orbiter to take a look at the Earth's magnetic field. The next Tethered Satellite System flight will reel out 100 km of cable and will trail it down into the atmosphere. It will collect data from regions too low for satellites and too high for aircraft or balloons, for much longer times than are possible using sounding rockets. Next comes a 500 kgm, 1.3 meter diameter satellite, to be held on a 100 km tether no thicker than a shoelace. The tether is made in a single, continuous filament—it calls for the use of a braiding machine 14 hours a day for nearly twenty-five weeks.

One nice potential use of a tether is as a power-producing mechanism. A space station with a 20-km tether should be able to drain a continuous 100 kilo-



Figure 2: The Tethered Satellite.

watts from the Earth's magnetic field. This looks like free energy, but there is a price. The orbit of the space station would slowly be lowered because of electromagnetic drag.

IV. MOMENTUM BANKS

The only function of the Shuttle in tether satellite operations (apart from carrying the tethered satellite up to orbit) is to provide a *momentum bank*. The idea only works if the parent spacecraft is many times as massive as the tethered spacecraft, or the mission is short—otherwise both would be dragged down into the atmosphere together.

The idea of the massive orbital momentum bank has other attractive uses apart from tethered satellites. It leads to another method of minimizing the reaction mass needed to reach space. The basic principle used here can be stated in one sentence: It is much easier to *reach* a given altitude than it is to *stay* there. A spacecraft can arrive at an altitude with zero velocity, but it will promptly fall back to Earth. To sustain a given altitude, the spacecraft needs a considerable final velocity. To take one example, an object can reach 400 km altitude with an energy expenditure of about 3.5 million joules per kgm. However, to move into orbit at that height requires more than 32 million joules per kgm—nearly ten times as much. There is a simple approximate relationship between the energy needed to reach height h and the energy needed to achieve circular orbit at height h. It is:

$$\text{Lift energy/Orbital energy} = 2h/(2h + r)$$

where r = radius of Earth.

(This formula neglects the boost that a rocket can get from the Earth's own rotation, about 1,000 miles an hour for an equatorial launch.)

The formula shows that the higher the orbit, the less the difference between reaching a height and

reaching an orbit. The picture that you get by plotting the formula, for cases intermediate between full orbital speed at height h and no speed at height h, is shown in Figure 3. It was produced by Roger Arnold and Donald Kingsbury, and published in *Analog* magazine, in November 1979.

We can send an object to 400 km height economically. The problem clearly is to keep it there. To do that we have to catch it with some orbiting object. This is where the momentum bank comes in, to provide the missing momentum to our spacecraft. Any large mass at the right height will do—but the capture process is another story.

One way, proposed by Arnold and Kingsbury, is through the use of a large electromagnetic accelerator—a linear synchronous motor. However, the dimensions of this motor are very great. If we accept an upper limit of 5 gees for our acceleration (which is low for most cargoes, but reasonable for humans) then we find that the spaceborne accelerator to achieve orbital velocity must be about 600 km long. The same motor, applied in reverse, will give a spacecraft a deceleration that allows it to return to Earth in the same way as it ascended. But the size of it may be prohibitive.

Let us examine an alternate method of accelerating into orbit a spacecraft that has reached a desired altitude with zero residual velocity. We will use a *rotating* space tether, attached to the massive parent spacecraft. The geometry is shown in Figure 4.

The spacecraft rises to encounter and attach to the end of the tether. Since the tether rotation is opposite to the motion of the orbiting parent spacecraft and designed to exactly match the speed at its outer end, the rising spacecraft will be *at rest* relative to the end of the tether when the latter is at the low point of its rotation. The tether now provides the tension to accelerate the spacecraft up to orbital speed.

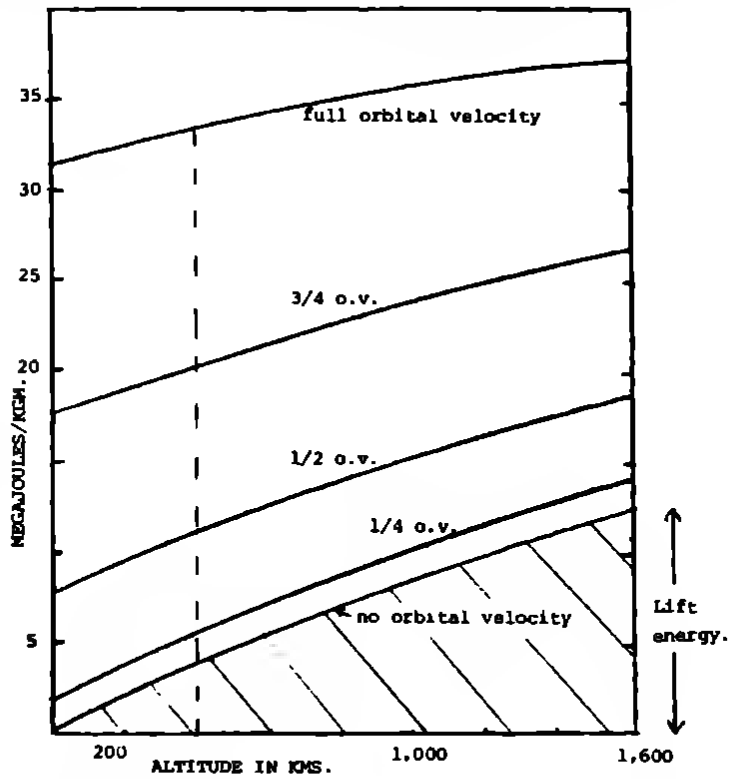


Figure 3: Energy to reach altitude vs. orbital energy.

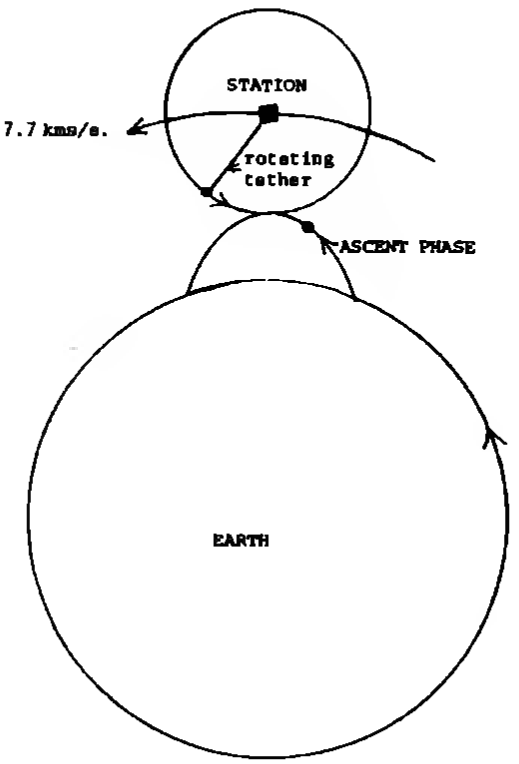


Figure 4: Tether Capture Geometry.

This sounds like an attractive alternative to the linear motor. Unfortunately, it has its own problems. Let us look at a hypothetical case, where the parent spacecraft has a speed of 7.7 km a second and the tether is 100 km long. Ignore for the moment the mass of the spacecraft that we want to catch, and look just at the tether. It has to have a speed at its outer end of 7.7 km a second, so it has a total rotation period of only 82 seconds. This means that the centrifugal forces on the tether are very large. It turns out that a tether made of some readily available strong material, such as Kevlar, is not strong enough to support its own rotational forces. Kevlar can take a load of maybe 28 tons/sq. cm. The pull at the center of the rotating tether is over 200 tons/sq. cm. The tether would break under its own weight.

One way out of this problem would be to compromise, and say that we will not launch a spacecraft that has *zero* orbital speed when it reaches a desired altitude. Instead, it will have some specified fraction of orbital speed. This approach has been explored in some detail by Arnold and Kingsbury, but we will not pursue it here. No matter what we do with the idea, we still need some reaction mass. Let us instead go back to our first thought, the fishing line from geosynchronous orbit, and see where that takes us.

V. BEANSTALKS, SKYHOOKS, ETC.

The idea we are now about to discuss was suggested first by Tsiolkovsky, in 1895, as a passing comment. It was seriously explored by a Russian, Artsutanov, in 1960, but his work was not known in the West. The idea was re-discovered and published in *Science* in 1966, by Isaacs, Vine, Bradner, and Bachus. This group of workers at Woods Hole was led to the idea from a consideration of deep-sea cables. Since then it has been independently redis-

covered at least twice. (Rediscovery tends to occur because the device has no agreed-upon name. It has been termed a beanstalk, a space elevator, a skyhook, a heavenly funicular, an anchored satellite, and an orbital tower. My own favorite name for the device is the first one, and I will usually call it a beanstalk.**)

Let us begin with a few basic observations. First, massless lines exist only in mechanics textbooks. Since any real line has mass, it can't simply run down from a position at geosynchronous height. Its mass would pull it down to Earth. Thus there must be some compensating mass out beyond geosynchronous orbit—perhaps another length of line. Second, if we string a line from orbit to Earth, it should not be of uniform cross-section. The cable need only support whatever length of itself lies below it (or above it, if we extend the cable beyond geosynchronous height). Thus the cable would be thickest at geosynchronous height, tapering to thinner cross-sections all the way down to the ground or out beyond geosynchronous orbit.

We begin by looking at the shape of this tapering cable. In practice, any useful cable will have to be strong enough to stand the added weight of cargo and lift system. But let us first determine the shape of a cable that supports just its own weight. This gives us a problem in elementary statics, and a simple differential equation. Solving that gives us this form:

$$A(r) = A(R).\ \exp\ (K.\ f(r/R).d\ /T.R)$$

In this equation, A(r) is the area of the cable at height r, A(R) is the height at geosynchronous orbit, K is the Earth's gravitational constant, d is the den-

**Two novels based on the idea, Arthur Clarke's *The Fountains of Paradise* and my *The Web Between the Worlds*, appeared almost simultaneously in 1969. The chance of further independent rediscovery thus seems less probable now.

sity of cable material, T is its tensile strength, and f is the function $f(x) = (3/2 - 1/x - x^2/2)$.

The form of the equation for A(r) is revealing. First, we note that the *taper factor*, which we define as A(r)/A(R), depends only on the *ratio* of tensile strength to density, rather than actual tensile strength or the density. Thus we want to make a beanstalk from materials that are not only strong, but light. Second, the taper factor depends exponentially on d/T. If a cable has a taper factor from geosynchronous orbit to Earth of 100, and we could somehow double the strength-to-density ratio, the taper factor would be reduced to 10. Double the strength-to-density again, and the taper factor would go down to 3.162 (the square root of 10). Thus the strength-to-density ratio of the material used for the cable is enormously important.

To produce a stable system, we must have a balancing outward force to match the downward pull of the cable. This is accomplished by extending the same cable *upwards*, beyond geosynchronous height, and placing a ballast weight at the end. The overall geometry of the beanstalk that extends from geosynchronous orbit to the Earth's equator is shown in Figure 5.

VI. THE "ENGINEERING DETAILS"

We have described the mechanics of the system, and they are elementary. But now we must ask another question. Do materials exist that would allow us to build a beanstalk with a reasonable taper factor—say, no more than 100? Otherwise, we are engaged in an academic exercise. To answer this question, let us define another term: the "support length" of a material is the length of material of uniform cross-section that can be supported in a one-gee gravitational field. This definition is convenient, since it represents the way that a material can easily be

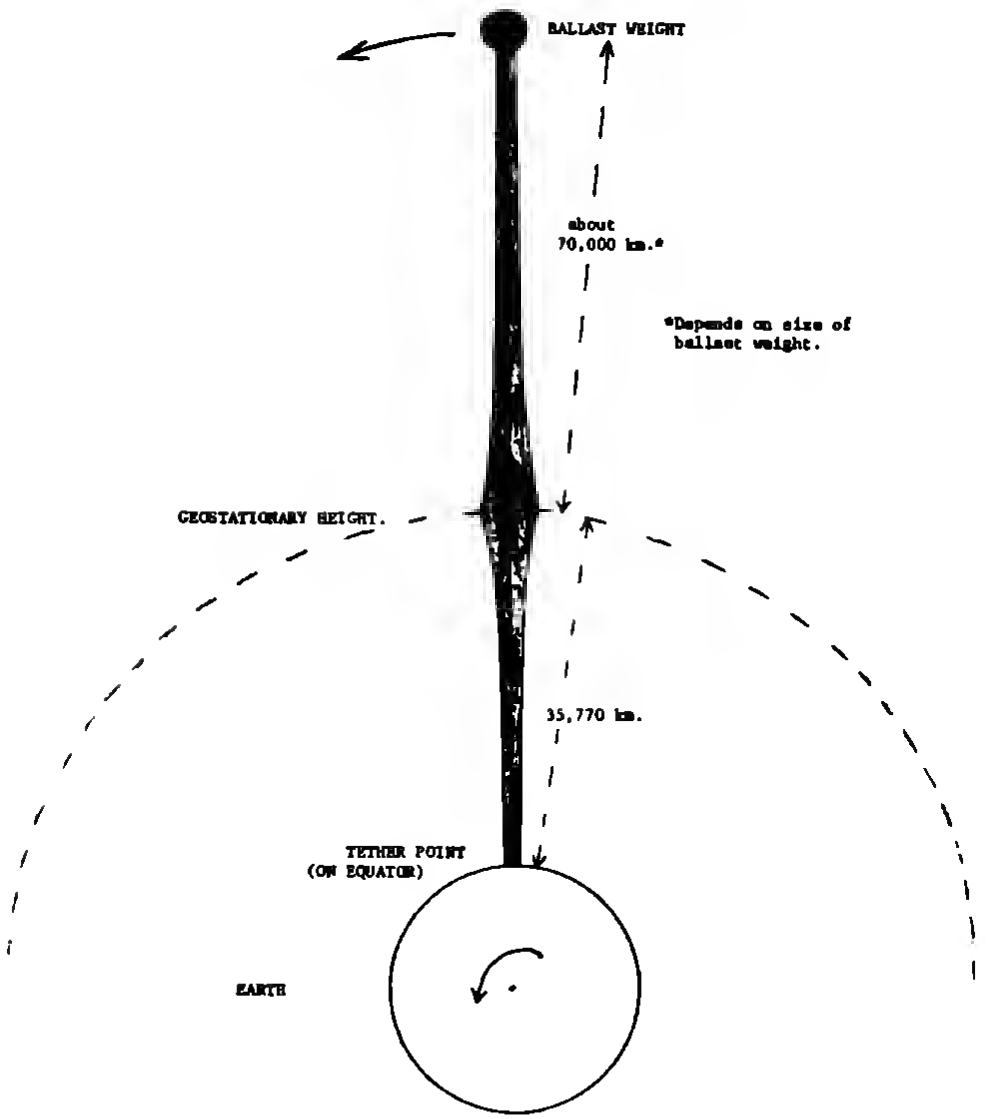


Figure 5: Beanstalk.

tested—by taking a filament of the substance, and hanging weights on it.

A beanstalk from geosynchronous orbit to the Earth's surface will be about 35,770 km long. However, the gravitational field diminishes as we go higher. It turns out that the equivalent support length required is therefore much less—about 4,940 km. Since the actual cable would be tapered, this support length of 4,940 km will be a good deal more than we need. On the other hand, we want to hang a transportation system onto the central cable, so there has to be more strength than we would need for the cable alone. The figure of 4,940 km is thus a good one in terms of which to evaluate available materials. If materials are available which have support lengths this big or greater, then the beanstalk looks like a practical possibility. If not, we have problems.

Presently available materials are illustrated in Table 1. We see that no material we can fabricate today has enough strength to be used as the cable for a beanstalk.

That might seem to be the end of the story, except that we are talking here of 21st-century engineering and the materials we expect to have available 50 to 100 years from now. It is instructive to look at the history of materials available to us and see how they have changed over time. This is presented in Table 2.

It is dangerous to attempt curve-fitting to this type of data. My only attempt, in the form Material Strength = B/(t - T), with t the time and B and T determined from the data, predicted infinitely strong materials before the year 2000.

Extrapolation without physical models is too dangerous. Let us instead look at the physical limiting factors to materials strength. In chemical reactions, only the outermost electrons of an atom participate. It is the coupling of these outer electrons that decides the strength of chemical bonds, and it is those

TABLE 1

STRENGTH OF MATERIALS

Material	Density (gm./cc.)	Tensile Strength (kg./sq.cm.)	Support Length (km.)
Lead	11.4	200	0.18
Gold	19.3	1,400	0.73
Cast iron	7.8	3,500	4.5
Manganese steel	7.8	16,000	21.
Drawn steel wire	7.8	42,000	54.
KEVLAR, Type 29*	1.4	28,000	200.
Silicon whisker	3.2	210,000	660.
Graphite whisker	2.0	210,000	1,050.

**Kevlar™, Dupont Corporation.*

bonds that in turn determine the strength of a material. In terms of such strengths, the nucleus, where almost all the mass of the atom resides, contributes nothing. In particular, neutrons in the nucleus add mass, but nothing to bonding strength. We would therefore expect that the strongest bonds are possible in materials with the fewest neutrons, i.e., the lightest elements.

Table 3 shows that this argument is quite correct. The strongest material by far would use a hydrogen-hydrogen bond. In such a case, each electron (there is only one in each hydrogen atom) contributes to the bond and there are no neutrons to add wasted mass.

The solid hydrogen cable would do us nicely, with

Table 2

PROGRESS IN STRENGTH OF MATERIALS AS A FUNCTION OF TIME

Year	Available Material	Tensile Strength (kg/sq.cm.)
1500 B.C.	Bronze	1,400
1850	Iron	3,500
1950	Special steels	16,000
1970	Drawn steel	42,000
1980	Graphite and silicon whiskers	210,000

Note: Years given indicate the dates when the materials could first be reliably produced in production quantities.

a support length about twice what we need. However, solid crystalline hydrogen is not yet available as a working material. Metallic hydrogen has indeed been made, as a dense, crystalline solid at room temperature—but at half a million atmospheres of pressure.

While we are looking at materials that do not yet exist, we may as well consider a couple more of them. The last two items on Table 3 are pure speculation. The muonium cable would be made of hydrogen in which the electrons in each hydrogen atom have been replaced by muons. The muon is like an electron, but 207 times as massive, and the resulting atom should be 207 times as small with correspondingly higher bonding strength. The muonium cable

has other problems apart from the difficulty of making it in solid form. The muon has a lifetime of a millionth of a second. And because the muons spend a good part of the time close to the proton of the muonium atom, there is a pretty high probability of spontaneous proton-proton fusion.

Positronium takes the logical final step in getting rid completely of the wasted mass of the atomic nucleus. It replaces the proton of the hydrogen atom with a positron. Positronium has been made in the lab, but it too is unstable. It comes in two varieties, depending on spin alignments. Para-positronium decays in a tenth of a nanosecond. Ortho-positronium lasts a thousand times as long, a full tenth of a

TABLE 3.

MATERIALS: POTENTIAL STRENGTHS

Element pairs	Molecular weight*	Bond strength (kcal/mole)	Support length (kilometers)
Silicon-carbon	40	104	455
Carbon-carbon	24	145	1,050
Fluorine-hydrogen	20	136	1,190
Boron-hydrogen	11	81	1,278
Carbon-oxygen	28	257	1,610
Hydrogen-hydrogen	2	104	9,118
Muonium-muonium	2.22	21,528	1,700,000
Positronium-positronium	1/919	104	16,750,000

*Not all these element pairs exist as stable molecules.

microsecond. As Arthur Clarke remarks, when you shop for positronium, be sure to buy the brand marked "Ortho."

We don't really need these exotic materials. The hydrogen cable would do us nicely. It would have a taper factor of 1.6 from geosynchronous to Earth. A cable 1 cm across at the lower end would mass 30,000 tons and be able to lift payloads of 1,600 tons to orbit.

Let us also note in passing that beanstalks may be easier for other planets. Table 4 shows what beanstalks look like around the solar system if we use solid hydrogen as the construction material. Mars is especially attractive. We can make a beanstalk there with available materials. The support length we need is 973 km, and graphite whiskers exceed that.

Naturally, the load-bearing cable is no more than the central element of a beanstalk that will carry materials to and from orbit. The rest of the system consists of a linear synchronous motor attached to the load-bearing cable and driving payloads up and down it. Note that the energy we expend carrying the load up can be at least partially retrieved when we lower an equivalent load to Earth. A section of the whole system is shown in Figure 6.

We would naturally build such a beanstalk *from the top down*. In that way, by extruding cable simultaneously up and down from geosynchronous orbit, we keep a balance of outward and inward forces. We also make sure that all the forces we are dealing with are tensions, not compressions.

The cable is tethered at the equator. The system offers a fringe benefit: if we send mass all the way out to the end of the cable, way beyond geosynchronous orbit, then we have a free launch system. A mass released from 100,000 km out can be thrown to

TABLE 4

BODY	RADIUS* OF STATIONARY SATELLITE ORBIT (km.)	Taper Factor
Mercury	239,731	1.09
Venus	1,540,746	1.72
Earth	42,145	1.64
Mars	20,435	1.10
Jupiter	159,058	842.
Saturn	109,166	5.11
Uranus	60,415	2.90
Neptune	82,222	6.24
Pluto**	20,024	1.01
Luna	88,412	1.03
Callisto	63,679	1.02
Titan	72,540	1.03

***Pluto's satellite, Charon, is thought to be in synchronous orbit. If so, a Beanstalk directly connecting the two bodies would be possible.*

**Orbit radius is planetary equatorial radius plus height of a stationary satellite.*

any part of the solar system. The energy for that, incidentally, is free. It is provided by the rotational energy of the Earth itself.

VII. OTHER OPTIONS: ROTATING BEANSTALKS AND INDIAN ROPE TRICKS

Beanstalks sound great, but we can't build them with today's construction materials. What we would like to have is something that needs no reaction mass and can be built *now*.

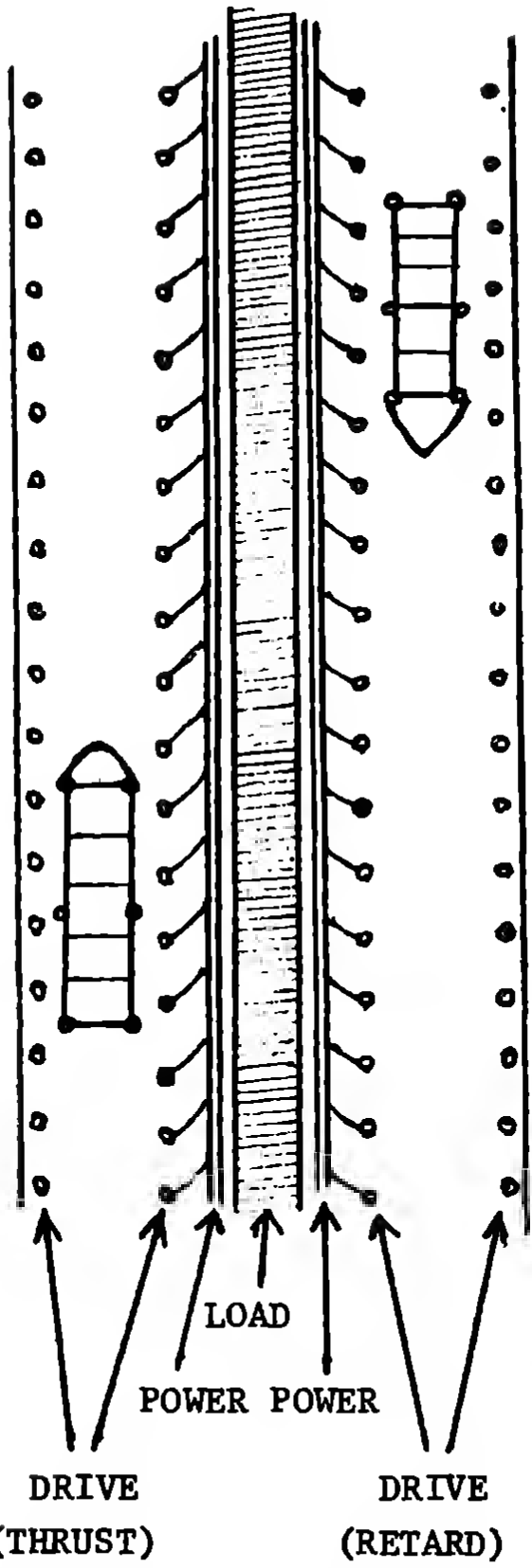


Figure 6: Cross-section of the beanstalk, showing load cable, power cables, drive trains.

There are three candidates for such a system. The first one is implied by something we have already looked at. Consider the system of Figure 4 and examine it in the light of Figure 3. The lower left-hand corner of the energy chart shows that it takes no energy at all to launch an object to zero height—not a surprising result. Thus if we lengthen the tether of Figure 4 until it reaches all the way to the surface of the Earth, we can simply pick up objects from there as we go past (shades of "The Space Coffin"). Such a device has been seriously studied by Hans Moravec. It is called a *non-synchronous skyhook*, and it can be built with a taper factor of 10, from graphite whiskers. The easiest way to visualize this rotating tether is to imagine that it *rolls* around Earth's equator, with the tether touching down once per tether revolution.

The geometry is such that the skyhook enters the Earth's atmosphere and touches down vertically, with no horizontal movement relative to the surface. Payloads can then be attached to it. But you have to be quick. The end of the tether comes in about 1.4 gee, then is up and away again at the same acceleration.

The non-synchronous skyhook is one way of avoiding extreme material strength, but it is still a first cousin of the static beanstalk. The other approach is fundamentally different. It is what I like to call the Indian Rope Trick. In this case it's not clear just who had the basic idea first. Marvin Minsky, Bob Forward, and John McCarthy all had a hand in it, and I did the only analysis of its stability that I'm aware of.

Consider a continuous stream of objects—say, steel bullets, launched up the center of an evacuated vertical tube. The speed of these bullets when they leave Earth is to be greater than escape velocity, achieved using an electromagnetic accelerator on the ground. As the bullets ascend, they are slowed by gravity and also by electromagnetic coupling with

coils in the side of the tube. Thus they transfer *upward* momentum to the tube as they are slowed. At the top (which can be at any height, but let's say that it is at synchronous altitude) the bullets are caught and slowed to a halt by electromagnetic coupling. Then they are reversed in direction and allowed to drop down another parallel evacuated tube. As they descend they are accelerated *downwards* by coupling with another electromagnetic driver in the tube. This again will provide an upward transfer of momentum to the tube walls. The geometry is sketched out in Figure 7.

If we arrange the initial velocity and the rate of slowing of the bullets correctly, the upward force contributed by the bullets to the rest of the system will match the total downward gravitational force at that height. There is thus no need for strong tube walls. The whole structure stands in dynamic equilibrium.

Note the word "dynamic." The biggest objection to this type of beanstalk may be that it only works provided there is a continuous stream of bullets, with no time out for repair or maintenance. This is in contrast to the earlier beanstalks we have described, which are in static equilibrium and stand on their own without requiring a source of energy to keep them going. Seen from the outside, there is no indication as to what holds the structure up, which is why I like to call it the Indian Rope Trick.

The Dynamic Beanstalk can be of any length, but to be most useful it will go all the way to synchronous orbit. At that height materials can be left in position without requiring any additional boost to hold a stable orbit.

A device which is at first sight somewhat similar to this, termed a *Launch Loop*, has been proposed by Keith Lofstrom. In his version, a continuous, rapidly-moving metal ribbon is led through an evacuated

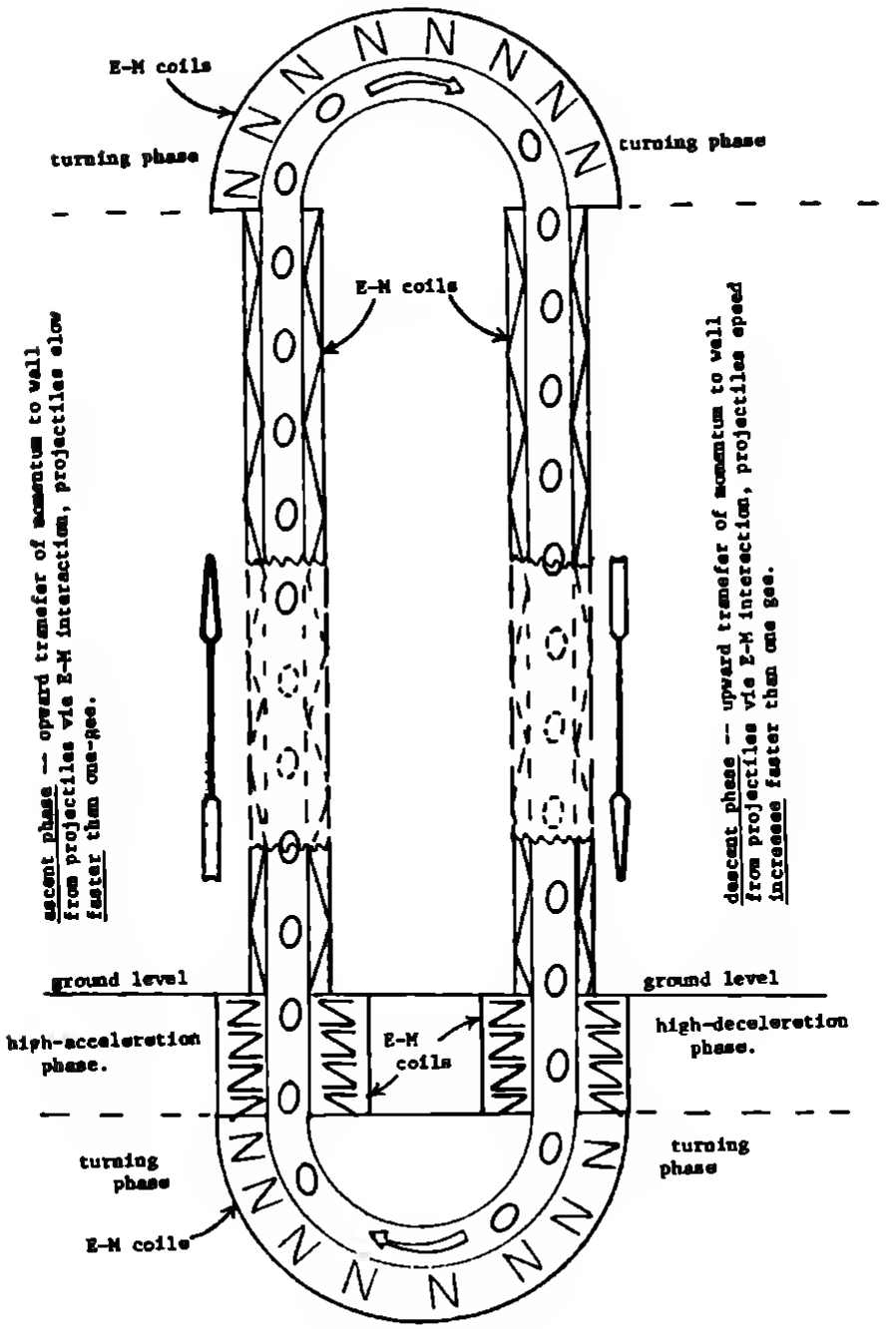


Figure 7: Indian Rope Trick: the Dynamic Beanstalk.

narrow tube. The tube has an inclined first section, running from west to east and rising at 20 degrees from ground level. This leads to a 2,000 km-long acceleration section, 80 km above the Earth's surface, also running west-east, and then to the descending third section. Finally the tube returns at sea level from east to west, back to its starting point. The general geometry is shown in Figure 9.

The metal ribbon is only 5 cm wide by 2.6 mm thick, but it moves at 12 km a second. Since the orbital velocity at 80 km height is only 7.86 km per second, the ribbon has super-orbital velocity and there is a net outward force on it. This outward force is enough to support the whole structure—the ribbon, the containing tube, and the electromagnetic launch system employed to send payloads to orbit. Payloads 5 tons in weight can be launched horizontally from the acceleration section. The whole structure will need about a gigawatt of power to run. The hanging cables shown in Figure 9 are needed to balance the lateral forces produced by the launch mechanism's acceleration of the payloads.

The Launch Loop differs from the Dynamic Beanstalk in important ways. In the latter the structure is supported by the upward transfer of momentum from a decelerating upward particle stream and an accelerating downward particle stream. By contrast, in the Launch Loop the ribbon moves at *constant* speed, and the upper section is maintained in position as a result of centrifugal forces.

The Launch Loop shares one disadvantage with the Dynamic Beanstalk. Both will stay in position only while there is a flow of materials through the evacuated tube. If the ribbon stops, or the particle stream ceases, the structures will at once come crashing down to the ground.

VIII. WHAT COMES NEXT?

Which one of the devices we have described, if any, will be built in the next century? One argument that has been raised against all these ideas is their dangerous nature. If a beanstalk were severed, say the critics, or a launch loop's power were lost, the results would be catastrophic. A severed beanstalk would coil most of the way around the equator, entering the Earth's atmosphere like a thirty-thousand-kilometer whip, at supersonic speed. No one would allow such a structure to be built.

That is true—assuming today's perceptions of "safe" and "unsafe." But those perceptions change. If you had told George Washington that you wanted to hang hundreds of tons of metal up above his head operated by an engine that had to keep working lest the whole thing fall, he would have refused to consider the idea. And given the technology of his time, he would have been right.

Yet we accept that situation. We have aircraft above us every day, and seldom think about the possibility of them crashing down on top of us. We have learned to have faith in today's technology. Our grandchildren will learn to have faith in a much greater technology. Failure rates will be far lower. Many things that are seldom inspected today will be under continuous computer supervision, with automated repair capabilities. In that environment, most of the devices described here will be socially acceptable. They should also be technologically feasible. We are technologically closer to a beanstalk, today, than we were to the Space Shuttle in 1900.

Which one is most likely to be built?

My own favorite is the static beanstalk. It is the simplest and the one with the most potential for development.

When?

Let me be conservative and say, within a century.

But I would not be surprised to see a small prototype (with, say, a cable only a few microns across at the lower end) in position thirty years from now. The necessary preliminary work on tethers is moving ahead fast. And a beanstalk has bootstrap potential: when one is in position, no matter how small, it can be used to carry the materials to make it bigger. After the first, the rest will be easy.

I feel sure of one thing. Beanstalks are addictive. Once we have tried them, it is hard to imagine that anyone will ever want to go back to rockets.

This article was presented as a lecture at NASA's Langley Research Center, October 15, 1985.

EDITOR'S INTRODUCTION TO:

DANCING WITH THE STRAW MAN

Some issues are too important to be addressed only once, and Star Wars is the ultimate example. It is our contention that the survival of Western Civilization depends on the resolution of this issue. This time we offer an insider's view of how the Strategic Defense Initiative was transformed from just another dose of that visionary Buck Rogers Stuff into our potential rescue from long-term Soviet military dominion. In the process Dr. Benford explains why the feasibility of city defense is not really the issue, and unilaterally assured vengeance is.

—JPB

Dancing With the Straw Man

Gregory Benford

Edward Teller is a daunting job interviewer.

What's more, the Personnel office at the Lawrence Radiation Laboratory sprang Teller on me without warning. I had gone up to Livermore to discuss working there as a research physicist, following my doctoral thesis at the University of California, San Diego. On an early afternoon in 1967 I met Teller. To my surprise, the other physicists with me quickly excused themselves and left Teller's large office. Teller was scientific director of the Laboratory then, already a legend for his work developing the A-bomb and H-bomb, and his epic split with Oppenheimer.

In the next hour no one disturbed us as he quizzed me about my thesis in detail, turning every facet over to find undiscovered nuances, some overlooked difficulty, a calculation perhaps a bit askew.

He was brilliant, leaping ahead of my nervous explanations to see implications I had only vaguely sensed. Somewhat to my surprise, I apparently passed inspection. At the end, he paused a long moment

and then announced that he had "the most important kvestion of all." Leaning closer, he said, "Vill you be villing to vork of veapons?"

Unbidden, images from Stanley Kubrick's film, *Dr. Strangelove*, leaped to mind. But Teller had impressed me as a deep, reflective man. I said I would—occasionally, at least. And that began my long, winding involvement with what's now known inaccurately as "Star Wars," or the Strategic Defense Initiative.

I spent four years at Livermore, much of it working on the development of peaceful uses of thermonuclear fusion, not warheads. There was a large overlap in the basic physics of fusion and that needed by another group at Livermore—particle beams research. I began studying how beams of highly energetic electrons might travel through air. They could protect fixed installations against attack by very fast craft—'point defense.' The idea was to fire dense streams of electrons moving near the speed of light, to instantaneously knock out anything—fighter planes, missiles, even ICBM warheads—coming within twenty miles or so.

In those days, the idea of defending missile sites or command centers was unfashionable, mostly because the only sure way to do it lay in launching nuclear-tipped missiles of our own. Incoming warheads could travel at five miles per second, so a big, nuclear blast was the only certain way to get a "kill." This unpleasant fact ultimately led to the 1972 Anti-Ballistic Missile (ABM) Treaty, which greatly limited ground defense and ruled out space defenses altogether.

Teller disliked the ABM Treaty, feeling that it insured a perpetual posture of vulnerability. I discussed both physics and politics with him, finding him delightfully eccentric and original. One hammering-hot summer day in Livermore, we continued

well into the lunch hour. Teller wanted to go swimming, but refused to break off discussions. I went with him. He cut an odd figure as he threaded among the muscular sunbathers, mind fixed on arcane points of theoretical physics, his skin pale as the underbelly of a fish. He unfastened his artificial foot, unembarrassed, and kept talking physics even as he wriggled over to the edge. He earnestly concluded his point, satisfied, and then seemed to realize where he was. I could almost hear him think, *Ah yes, next problem*. "Edward," I began—and Teller instantly flung himself like an awkward frog into the water, obliviously comic.

With his penchant for problem-solving, Teller was becoming a symbol of the "techno-fix" school of warfare, and the times were running against him. At one Livermore lunch, an arms control negotiator furiously said to me, "He's the Satan of weapons! We've got to stop him." Many scientists felt just as strongly. Unlike many older physicists who had worked on the bomb, Teller didn't believe in prostrating ourselves before its awesome power. He supported the group I worked in, devoted to point defense rather than trying to shield the whole country.

Work went slowly, in part because the reigning notion was that the SALT and ABM Treaties would freeze both sides into a rigid stance of Mutual Assured Destruction (MAD, appropriately enough). "Veapons vork" seemed an intellectual backwater to some, since most scientists assumed arms control was really the inevitable answer, anyway. Defense against ICBMs was a topic for the "Leisure of the Theory Class," and few expected useful results. With such an attitude, they were undoubtedly right.

The Point Defense group kept on its sleepy slog toward a dimly-seen goal. That eventually drove me to leave for a professorship at the University of California, Irvine. Though I continued to do consulting

that touched on defense issues, my principal interest at Irvine was in developing a laboratory to explore how electron beams propagate. I wanted to study the basic physics, mostly because lots of interesting astrophysical objects have electron streams in them—pulsars, quasars, even our sun.

Searching for Satan

On a bright spring day in 1975, I passed a rally on the way to my office, not noticing what it was about. A protester stepped in front of me, brandishing a sign:

NUCLEAR BOMBS = NUCLEAR POWER = NUCLEAR "MEDICINE" "What side're *you* on?" he asked me, as if these were all the same issue. I couldn't help but ask, "How do you feel about the nuclear family?" and walked on, shaking my head.

I found the university beset by believers in the Devil Theory. Not for them the assignment of relative risks, the weighing of alternatives. They wanted a devil to blame, and usually they found one.

They fretted over potential deaths from nuclear power plant accidents—citing them as the primary environmental threat—but didn't want to hear about the hundreds of Californians who die every year from breathing the fumes of oil-burning power plants. Nuclear war was terrifying, so they blamed it on the weapons, not on the nation-states which made them.

Luckily, my research seldom intersected the issues of the seventies—energy crises, environmental hazards. I built up a laboratory to study how electron beams propagate and emit electromagnetic radiation, chiefly microwaves. This applied to astrophysics, but I occasionally consulted for companies doing research and development (R&D) on problems in nuclear warfare. Warheads reentering the atmosphere create plasmas, and attempts to destroy them with beams or

explosions also make plasmas—all of which emit electromagnetic waves. I looked into the "signatures" and possible defense uses of these waves.

Amid this, I ran into Herb York, whom I knew from my UCSD days. He had played a leading role in arms negotiations, but in 1977 he seemed worried. "We're still adding warheads, and so are they," he said.

I asked why. "Insecurity on both sides. Sheer momentum!" He grimaced, agitated. "It's not working." I nodded sympathetically. His suntanned, furrowed face wrinkled still further. "Maybe if we had a few more agreements . . ." But I could tell he had begun to doubt his own faith.

The Moral High Ground

Ronald Reagan likes advisors from outside the Washington establishment. In the early 1980's, he got important scientific advice from several informal California groups.

One of his allies, Jerry Pournelle, is rangy, technophilic and occasionally dangerous. He can hit a beer can at fifty yards in a crosswind, run a political campaign, debug a computer program and write a bestselling novel—simultaneously. He holds degrees in physics, psychology and political science, and was a professor at Pepperdine College. When he asked me to serve on the Citizens' Advisory Council on National Space Policy in 1982, at first I didn't realize that Jerry wasn't proposing just another pressure group. This was a body which had direct lines to the White House, through National Security Advisor William Clark.

Pournelle dominated the Council meetings with his Tennessee charm, techno-conservative ideas and sheer momentum. An oddly varied crew assembled: writers, industrial searchers, military and civilian ex-

perts on subjects ranging from econometrics to rocketry. In its reports, Council members were not identified by their academic or company origins; each acted as a private citizen. The Council met at the spacious home of Pournelle's collaborator, novelist Larry Niven, who has the offhand ease appropriate to a Doheny scion.

They were a raucous bunch, full of feisty opinions. The men talked hard-edge tech, the women policy. Marvin Minsky of MIT and John McCarthy of Stanford, leading pioneers in artificial intelligence, talked about the possibilities of robots in space. Everybody wanted to propose bold new programs to Reagan—a space station, orbiting solar power collectors, Moon bases, new planetary missions.

Pournelle not only stirred the pot, he turned up the heat. Amid the buffet meals, saunas and jacuzzis, well-stocked open bar and myriad word processors, a curious thing happened: ideas simmered, some emerging better than half-baked. A familiar tension emerged between the techno-dreamers and the practical political types. These realists argued that there was no point in the Council proposing programs that had no political vector, that could not win a quick constituency.

Teller wasn't there—but not from oversight. "He's great, but after all," a Council member explained to me, "this guy helped invent the atom bomb itself. When he speaks, he expects everybody to listen *very* carefully and *very* quietly." Such a Mandarin presence wouldn't work in the roiling cross-talk of the Council, so Pournelle politely persuaded Teller to send his lieutenant, Lowell Wood.

In the 1970's, Teller had focused more and more on what he called "third generation" nuclear weapons. The A-bomb was the first generation, with the thousandfold more powerful H-bomb the second. Always a proponent of using nuclear charges creatively, he had led the fight to dig canals and harbors with

controlled explosions. That campaign died a slow death, finally succumbing to the Test Ban Treaty. But Teller kept working on the notion of energizing a new kind of laser with a very small nuclear device. This could yield the intensity necessary for a laser which spat x-rays. Such beams could destroy ICBMs far more easily than the longer wavelength lasers of ultraviolet or optical type. By the early 1980's, in a series of underground nuclear tests in Nevada, Livermore physicists had produced x-ray laser pulses. Appropriately enough, this program was code-named Excalibur, for the magic sword of Camelot.

Lowell Wood had worked closely with Teller on this, and envisioned a defensive satellite which could emit many x-ray laser bolts from a single nuclear detonation, neatly skewering all the rising Soviet ICBMs at once. This nuclear burst would vaporize the satellite, of course, and the battle would be over in a second.

Wood was a burly, bearded defender of the x-ray laser idea. He and others gradually steered Council discussions around to considering space-based defense as *the* way to approach the White House.

Pournelle charmed, cajoled, conferred. He knew Reagan thought the MAD posture was absurd: "Two fellas jammed into a phone booth, threatenin' each other with hand grenades," he said with a derisive, stentorian bray. Could there be a Ballistic Missile Defense? Could they convince Reagan that *space* held the answer?

The Council was techno-dominated and its report stressed daring possibilities, new routes. Pournelle and Niven have both written science fiction, and they drew upon fellow writers both for ideas and for their ability to produce readable copy. Some on the Council adopted General Danny Graham's High Frontier program intact—a plan to knock down ICBMs with small rockets pre-positioned in orbit. After all,

we knew far more about building "smart" rockets, no longer than your arm, which merely had to get in the way of ICBMs. The energy for this "kinetic kill" came from the ICBMs themselves, which would be moving at speeds of several miles per second. Anything solid striking them would set off the high explosive in the warheads, destroying the bomb before it could go off. Why propose x-ray lasers, whose deployment might easily lie decades away?

The x-ray laser's fatal flaw was that buzz word—*nuclear*. Many felt that proposing a defense which used nuclear bursts fell into the same old trap as the ABM. Non-nuclear defense was much sexier, highbrow, non-Strangelovian. Wood and Graham submerged their differences without resolving them, all pulling together for the short-term benefit of getting a unified report which could provoke action in Washington. So the Council's Summer 1982 Report had a strong gosh-wow element—hosannas to the punch and accuracy of lasers, the speed of microelectronics—and stressed the stabilizing character of defense.

I contributed technical arguments and some position papers on how to argue the case. After all, defense was more moral than threatening the lives of whole nations. Most important, no arms equilibrium is plausible without a significant, stabilizing defense. Otherwise, the only answer to a new offensive weapon is yet another.

The Report filtered upward, mingling with Teller's steady input. Teller met with Reagan on Sept. 14, 1982, and argued that the US *could* knock down ICBMs. But should we? Where did all this fit in the larger politicial arena?

As 1983 began, I kept hearing rumors that Clark's deputy, Bill McFarlane, was adopting arguments from the Council and Teller to push his own case: that the Nuclear Freeze movement threatened to stop US missile development without slowing the Soviets.

That meant Ballistic Missile Defense (BMD) might be the *only* way to counter future Soviet build-ups.

What's more, the MX missile was in trouble in Congress. Reagan wanted to ask for the first hundred of them soon. From his California governorship days Reagan knew that sweetening a piece of legislation makes it go down better. Ballistic Missile Defense, "a new hope for our children in the twenty-first century," made excellent sugar-coating for the MX pill.

McFarlane and Admiral James Watkins produced a "freedom from fear" briefing paper for Reagan, stressing that the President could take the moral high ground *and* counter the expected Soviet build-up. Reagan went for it.

I watched his speech of March 23, 1983, with an odd sensation. Here was the President, using phrases and ideas that first surfaced in casual swimming-pool talk less than a year before. A small, various group had actually managed to get through the bureaucracy. It was obvious Reagan *believed*.

But with a sinking feeling I heard Reagan envision a *total* defense of our population. Danny Graham's oversell had fused with McFarlane's anti-Freeze maneuver: total defense would make *great* box office. But I knew how huge such a task was. It takes far higher accuracy and reliability to knock down an "assets attack"—you must hit nearly every warhead. Reagan had handed his opposition a lovely counter-argument, and considerably muddied the waters.

The master politician didn't care. He saw a dome over the country, the eventual end to nukes. It had a ring, a clarion call back to a day when America depended not on the rationality of a bitter enemy, but on looking sharp and keeping your powder dry.

"Wait'll the arms controllers discover he really means this," I said to my wife. "You'll hear the howling for years."

Unfortunately, it was a prophetic remark.

Factions of every stripe descended on the Space Defense Initiative (SDI) issue. The press stuck the "Star Wars" label on it. Graphics artists for network TV relished the chance to show off their special effects: crackling blue laser beams, exploding yellow missiles.

Cried the arms negotiators, "Here comes yet another pernicious arms race." Defense was even more destabilizing than offense, they said. A country with a successful defense could strike first, then defend against the enemy's feeble reply.

But surely this applied only to a superpower that didn't read the newspapers. Everyone knew—didn't they?—that the USSR was ahead of the US in certain SDI technologies. There was no chance whatever they would not do research on defenses, whether or not we did.

A lot of discussion was at this same low level. The tenor of debate quickly settled into question-begging newspaper editorials and equally simplistic return salvoes. Reagan had scored a major political victory, outflanking the MAD proponents by seizing the moral high ground, linking a non-nuclear world with techno-dazzle at just the moment the public was bemused by personal computers and other marvels. But he alienated a scientific establishment already hostile to his conservative administration.

Carl Sagan and others immediately met with Soviet scientists and issued ringing warnings. Ironically, the primary Soviet figure was Academician Velikov, who bemoaned SDI but was himself head of a major Soviet SDI program. He even maintained with a straight face that the USSR had no anti-satellite weapon, even though it has been photographed. I wondered what game the USSR was playing.

Hearts & Glowers

After a week in the workers' paradise I had come to recognize the approach. Academician Galeev leaned nearer, his clear blue eyes earnest. "We know this thing will not do what your Mr. Reagan says."

We were nearing the somewhat besotted finish of a glorious banquet in Soviet Georgia. The region has the richest larder in the USSR, all displayed opulently this October, 1984, evening. There had been eloquent toasts from the Russians, the plates were stacked eyebrow-high on the table. I had answered the earlier toast to "peace between our two countries," with a reply in Russian—*meer ee svaboda*, "peace *and* freedom." The Soviets had hesitated, then applauded politely. "Freedom" was a loaded word here.

Now, in the convivial withdrawing banquet babble, Galeev hitched up his Italian trousers, rocked forward on his chair and focused on the issue I had come to dread.

Still, he deserved a reply. "It's not perfect, of course. But it could knock down a lot of ICBMs."

"Not nearly enough."

"To save cities, no."

"Does your president not know this?"

"Well, yeah. But political—"

"Ah! Your arms makers love this plan." Galeev had won the Lenin Prize in 1983 for plasma physics, and spoke with a voice of authority.

"What about defending silos, command centers?"

Galeev looked pained and plucked at the sleeve of his French jacket. "We could overcome such points by massive bombardment."

"You can't use an indefinitely large number of warheads. Too many and you'll run the risk of nuclear winter."

He waved away the point. I said, "If not, why're you building point defenses?"

He didn't deny it. Soviets are careful not to be caught covering up. "I do not know of such things."

He lived in Moscow, and certainly knew of the Golash system ringing his city. The ABM Treaty allowed this hundred-missile screen, with many radars, to defend the Mecca of the revolution. The US had foregone building any such defense, even around its silos. "Ok. If it won't work, why are you worried?"

"We hope in our hearts you will not believe you are safe. For then you start a war."

The dialogue always came to this point. First the hearts-across-the-sea, then the troubled glowers of potential threat. I wondered whether this simply reflected the incessant propaganda line—*Pravda* exactly echoed Galeev's thesis—or some orchestrated approach.

The tenacity with which Soviet physicists plodded through this ritual argument was striking, no less so at Karkhov, in the Ukraine. There the Institute of Physical Sciences squats, heavy buildings brooding behind three fences (one electrified, all lit by powerful arc lamps). The ranks of identical blocky buildings were veiled by a steady, bone-chilling rain. A colleague and I were the first Americans allowed inside since the early 1970's, when BMD became officially *passé*.

I was astonished at the quality of their experiments, at the array of electronic diagnostics, at the wide range of research. Their sophisticated computers contrasted mightily with the abacuses used to total bills in shops only a hundred yards away.

They had results on beam propagation and plasma dynamics that equalled or excelled ours—and this was merely what they were allowed to show us. Their talks were carefully arranged, all typed out beforehand for the translator. The speakers had mem-

orized the script letter-perfectly. Nothing would be said that was not fully approved. Plainly, the Karkhov labs had been working on beam weaponry for a long while.

Their anti-SDI litany came at lunch, then again at dinner. They were friendly, plainly relishing this whiff of Western contact. No one at Karkhov had ever been allowed out of the USSR.

I made a dumb mistake. That morning I had donned my raincoat in a hurry, only to realize later, inside the Institute, that I had a camera in the pocket. When I produced it, there was general consternation. They politely asked me to leave it in the reception room.

I should have realized how an intelligence officer would look at the incident. In Moscow a few days later, I noticed two men following me everywhere. Then somebody stole all my exposed film from my Academy of Sciences hotel room.

10,000 Warheads per Hour

Several people on the Advisory Council had argued that to be truly stabilizing, space defenses had to discourage first strikes while leaving both sides the ability to deliver a second strike. This meant that we couldn't allow a side to simply overwhelm the other's defenses by building more warheads. Either side could simply load more warheads and dummy balloons on each ICBM, to complicate the problem of shooting them down during their long flight above the atmosphere. Somehow we had to limit the number of missiles. This might come about naturally, if building defenses proved cheaper than deploying more highly accurate missiles. Rather gamble on that possibility—which couldn't be settled for a long time—most on the Council and in Washington concluded that shrewd cooperation with the USSR was neces-

sary from the very beginning of a BMD program.

Pournelle wasn't fond of this conclusion. "It means we gotta get in bed with the negotiators," he protested, horrified but resigned. The logic was inescapable.

But not widespread. In 1984, I was invited to debate Wolfgang Panovsky, former head of the Stanford Linear Accelerator, about SDI. When I arrived at Stanford and saw the audience, I knew I was in trouble. The debate was sponsored by the Physicians for Social Responsibility, and the crowd in the campus auditorium appeared to be already in agreement with Panovsky.

It was indeed a hard evening. Reviewing a video tape of it afterward, I was impressed at how Panovsky again and again was able to associate new weapons systems with destabilization. This "No Weapons Is Good Weapons" assertion was a knee-jerk response of many people earnestly seeking security. They had bought the Strangelovian metaphor—the weapons themselves were the enemy, so nothing could be done to or with weapons, defensive or not, to lessen our danger. Except for dismantling them, of course—though if the Cuban missile crisis taught us anything, I thought, it must be that you can teeter on the brink with only a few hundred missiles available.

At one point, a questioner began belaboring me with my "moral debt to the genetic heritage of humanity," and I realized that to many, advocating any weapon is to declare oneself in favor of war. As the London Times commented shortly afterward about such debates, "It is ironic and paradoxical that the age of deterrence has so confused the strategic mentality of many commentators that their reaction to a purely defensive system is to suggest that it increases the danger."

But what surprised and troubled me was the argument that since no plausible defensive screen could

knock out ten thousand warheads launched at us in an hour, this ruled out defense altogether. Nobody thought this situation was an argument against ten thousand warheads in the first place. Instead, defense was saddled with overcoming forty years of the arms race—all before the technology, much less the emerging strategy, was truly understood.

I went into the debate glad of a forum for earnest discussion. I left it sobered; only occasionally had we touched the underlying issues. Most of the audience seemed content to cook up simple scenarios which made defense look crazy. Others expressed wild-eyed optimism of the Reagan astrodome kind. They proceeded by erecting straw man arguments and then knocking them over, to partisan applause. Neither side wanted to consider point defense, because it mitigated grandiose, sweeping statements.

Attack of the Straw Men

The Union of Concerned Scientists issued a direct technical attack on SDI in 1983. Their original document contained some flagrant errors, which the Union was slow and reluctant to admit. I paid it little attention until Hans Bethe came to UCI in 1985 to argue against any form of Ballistic Missile Defense. When I looked into it, I found Bethe had made an error of about 1,500 in the weight of a laser satellite which could destroy ICBMs.

Hans Bethe is a stately gentleman, grey-haired and beaming with good-natured contentment. He has taken up the cudgels against SDI on the basis of his long work on nuclear war, which began with the Los Alamos A-bomb development. He won the Nobel Prize for detailing how the sun's fusion energy reaction works—the basis of all Earthy life. He began his talk at UCI with a lengthy technical summary, then added a layer of polite invective about

the SDI supporters. I studied the numbers on his viewgraphs and became puzzled. In the question session, I stood and asked about the blunder of 1,500.

After a pause Bethe said, "True, we made that error. But the argument against such ideas is not truly technical, anyway."

"But you've just spent an hour outlining a technical attack."

"Yes, but whether some kind of defense works is less important than the fact . . ." he jabbed a finger at the large audience, "the fact that if we begin to build defenses, and violate the ABM treaty, then the USSR will immediately abandon *all* treaties—ABM, SALT, the Test Ban Treaty—everything."

For this incredible claim he gave no evidence—but it *did* make a handy straw man to bind into pieces.

The Church of the Unwarranted Assumption

The Advisory Council met in August of 1984 in a mood of high celebration. Their pioneering work had yielded fruits unimaginable in 1982. Robert Heinlein, the dean of American science fiction writers, attended; the Council had attracted interest from some speculative quarters and, historically, writers had provided many ideas basic to the space program. Out of the shimmering summer heat came a surprise visitor—Arthur C. Clarke, in town to promote the opening of the film made from his novel, *2010*.

In 1950, Clarke had described an electromagnetic catapult to launch people and cargo from the surface of the moon. This idea evolved into the "mass driver" now being studied for use as a "magnetic machine gun" to shoot down ICBMs. Clarke had testified before congress against SDI, and regarded the pollution of space by weapons, even defensive ones, as a violation of his life's vision.

Heinlein attacked as soon as Clarke settled into Larry Niven's living room. The conversation swirled from Technical issues—Could SDI satellites be destroyed by cheap rocks put into orbit? Would SDI lead to further offensive weapons in space? Would it help or hinder other uses of near-Earth orbit?—to a clear clash of personalities. Clarke—cool, analytical, mild-mannered—was taken aback. His old friend Heinlein regarded Clarke's statements as both wrongheaded and rude. Foreigners on our soil should step softly in discussions of our policies, Heinlein said. Clarke was guilty of "British arrogance."

Clarke had not expected this level of feeling among old comrades. They had all believed in the High Church of Space, as one writer present put it. Now, each side regarded the other as betraying that vision, of narrowness, of imposing unwarranted assumptions on the future of mankind. It was a sad moment for many when Clarke said a quiet goodbye and disappeared into his limousine, stunned. Later that afternoon he asked me tentatively, "Do most of the American science fiction writers feel this way?"

Not most, but many. The faction grouped around Jerry Pournelle had provided crucial ideas and prose, but now others moved in, looking askance. President Reagan hailed 1985's *Mutual Assured Survival* by Pournelle and Dean Ing, another science fiction writer, as "addressing with verve and vision the challenges to peace and to our national security."

When science fiction was less prominent, writers pushed together for space development; now the entanglement of space with nuclear war divided them. Though still a research project, SDI touched deep wellsprings of the imagination. Isaac Asimov quit the board of governors of the L-5 Society, a pro-space lobbying group, because it would not take a firm stand against SDI. Heinlein reacted to this with stark

disbelief. Asimov, who was born in Russia, stuck to his guns. He said, "Star Wars? It's just a device to make the Russians go broke."

The Butter Barge

In March of 1985 I was visiting General Dynamics in Pomona, at the invitation of Keith Kato, who had done his doctoral thesis with me at Irvine. I gave a talk on ways to make beams of electrons produce intense bursts of microwaves. I had done the work to simulate pulsars, but it also had practical implications. Afterward, we threaded through the labyrinth of offices and I noticed that most were temporary, with modular construction, and asked why.

"We're expanding. They're a lot of R&D projects, and later on, of course, SDI."

"You think there's a future in it?"

He chuckled. "Teller doesn't lose many of these things, y'know."

I saw this moment as the fulfillment of that torpid Point Defense group at Livermore. The technical issues were still far from settled, but the change in strategic posture it championed was making headway. California companies were already studying the "systems architecture" of coupled weapons and computers, microchip sentries. The American hankering for hardware was promising an end-run around the moral vacuum of MAD. As Pournelle joked, "We just want to save the world and make a little money."

The motto in many high-tech companies is, "First R, then D." Do the ground-breaking research, and if it pans out, you can do the lucrative development—followed by the true profits in actual deployment.

Many seem to feel that simply pointing out that somebody will make a buck out of it constitutes a deep criticism of the SDI. Spending twenty-seven billion dollars in five years for defense research seems

a prudent measure, compared to roughly twenty-five billion dollars poured into offensive nuclear systems every year. Still, the "butter barge" for tech companies will warp the tenor of SDI thought as this budgetary engine gets rolling. California will benefit disproportionately, probably getting most of the twenty-seven billion dollars.

The Advisory Council recommended to the White House that Reagan not disperse the SDI studies among the three services, but instead erect a separate office. Luckily, he took the advice. The SDI Organization has moved swiftly and surely to study many systems and physics problems that must be understood before anyone can intelligently discuss deployment. Many of the technologies developing will have commercial uses; most will apply to point defense as well as the exotic space-based variety.

A crucial step in all this was the Treaty of Tarzana, negotiated during a 1983 Council meeting. In it, the Lowell Wood and General Graham factions agreed not to testify against each other before Congress. They had learned from the disputes that had split NASA for so long, when the proponents of manned space flight fought endlessly with the "black box" scientists who wanted to explore with automated probes and orbiting stations. ("Making the solar system safe for robots," as Pournelle scornfully called it.) Politicians had gotten each side to testify against the other, and used that to cut NASA's budget. The Council had more savvy.

But it is now obvious that both economic and philosophical issues will impinge on SDI as strongly as technical ones. Hiroshima unleashed not a Promethean fire but rather the elemental, destructive power of a human-dominated universe. This has provoked a deep yearning for a return to pre-nuclear innocence (though the survivors of Dachau would rightly laugh at such a naive description). Reagan

adroitly tapped this strong groundswell, promising salvation by high tech—the newest god in our pantheon. But his oversimplifications have so blurred the issue that public debate occurs in an unreal mist. Reagan recently declared that "we want to defend people, not weapons"—never mind that sheltering silos and command systems could prevent war *now*.

On the other side, Nobel laureates grind their axes, techno-patter rains down, politicians play to the gallery—ships passing in the night, their fog horns bellowing. Gerry Yonas, deputy director of the SDI Organization, said to me recently that the scientific community seemed irrational about SDI. "Somehow I think we will need more than luck—or even good results—to win them over."

There are real, concrete benefits to be gained by introducing defense of silos, of communications and control systems. This would make an immobilizing, "surgical" first strike impossible. Then, with time to build upon the small mutual trust engendered by such moves, we can see more clearly what a larger, city-sheltering systems would look like. And whether we want one.

Now is the time to discuss limited goals, in cool rhetoric. It is not the time to stand up straw men and be seen bravely knocking them down. The public deserves better.

EDITOR'S INTRODUCTION TO:

THE HIGH REACH

What distinguishes liberty from license? Answer: Liberty is exercised in full expectation of living with the consequences; license admits of no consequences. Liberty is the inalienable right of adults; license is the all-too-often granted privilege of the incontinent.

—JPB

The High Reach

Edward A. Byers

The city seemed washed in copper paint; the sun was low, incarnadine, a hurt-your-eyes red wheel.

I sprinted, panting, knots in my stomach. Sudden thought: *Whoa, Pony. Not that way! Cul-de-sacs can kill you.* I turned left instead of right, vaulted over a crumpled garbage can—nearly catching my skirt on a torn curl of metal—and glanced back. They were still there, both of them. Gaining on me.

An Old-Timer came out of a doorway. The man called Panzer straight-armed him. The old man *bounced* when he hit the concrete.

"There!" Panzer shouted, and pointed. The other man, Choctaw, thin, black, elongated—darted off to the right. Legs scissoring, arms pumping, he seemed as graceful as a veldt antelope. And I felt the first twinge of real panic. He was cutting me off, forcing me between two abandoned buildings.

The avenue between the buildings was about a hundred meters long, filled with crumbled masonry and burned out ground cars. The masonry was in

blocks, like ice floes in a river. I hopped up on one, jumped to the next, risked a look back.

They were up to something. Only Panzer was behind me now, face shiny with sweat, chest heaving, a grin fixed in place as he closed the distance between us.

It didn't take a genius to figure out that if Choctaw sprinted ahead, around the outside of the buildings, he'd be at the far end when I came out.

Mousetrapped. Very nice.

There was a bit of level space, and I used it, gaining ground on Panzer. He was big, with lots of muscle and some heavy hardware. His black leather vest was studded with brass and flak-lined. He was carrying a shotgun slung over his shoulder and there was a machete in his belt. And those were only the weapons you could *see.*

"Hey, look," he called. "Make it easy on yourself. Tractor John doesn't want you hurt."

"Not much, he doesn't!" I said, panting. I used my forearm to wipe sweat from my face. There was a shadow along the left wall. I went that way, feet thudding on concrete.

"You can't get away!"

I didn't bother to answer. The shadow turned out to be a doorway, partially blocked with debris. I tried the door. Locked, naturally.

Panzer saw what I was doing and put on a final spurt of speed. I tried to duck around him, but he cut me off. Finally we just stood there, five meters apart, looking at each other.

Then he pointed the shotgun. He said, "Put your weapons on the ground in front of you. *All* of them."

There wasn't any way out. Moving in exaggerated slow motion, I slipped the little throwing knife out of my shoe, laid it carefully on the ground. Then I took the chain from around my neck, showed him the

two-shot pistol hanging from it, and put it on top of the knife.

"Is that it?"

"Yes."

He grinned at me disbelievingly. Holding the shotgun in one massive hand, he dug through his shirt pocket with the other, finally fishing out a little metal stick with a wire loop at one end. He touched something, and it made a *beeping* sound.

"Here—catch!" He tossed it in my direction.

"What is it?"

"Metal detector."

I ran it up and down my body and it didn't beep once. Panzer looked satisfied. At his nod, I put it down by the knife and pistol.

He sat down on the edge of a block of concrete, relaxing, getting his wind back. He said, "You're a good looking woman, Pony. Too bad you got Tractor John mad at you. We might have had some fun."

Tractor John was head of the Street Outlaws. Panzer was his brother. Their kind of fun I didn't need.

"You gave us quite a chase," Panzer said. I detected a grudging respect.

"Not good enough."

"No. Tractor says to bring you in, make an example of you. That way everybody is happy with their contract."

Tractor John's contract was simplicity itself. Sign on the dotted line, he gets ten percent—of everything.

We stared at each other. Panzer was a blond giant, and if you ignored the broken nose and too-small eyes, he had rather raffish good looks.

I said, "You may have killed that Old-Timer."

Panzer smiled. "His fault. He should have been in a home."

I agreed, but didn't say so. Old-Timers had no business in the city. Most were frail and frightened.

Easy prey for gangs like the Outlaws. And they gave me the creeps. They gave *everybody* the creeps.

Panzer stood up. He had a glint in his eye. I put both hands down and plucked at the hem of my skirt, teasing him with it.

He looked a little puzzled. "How come you're not scared. Don't you know what's going to happen when we get to Outlaw court?"

"Will I get a traffic ticket?" I hiked the skirt halfway up my thighs.

"Goddamn, woman!" He moved forward a half meter, gestured with the shotgun. "Why didn't you just pay—like everybody else?"

I'd wondered that myself.

He clenched his fist. "*No*body stiffs the Outlaws! *No*body stiffs Tractor John!"

There was a flush in his cheeks that wasn't from running. He was looking at my legs. I rucked the skirt higher, backed up until I could go no further.

He kicked aside my weapons with a booted foot and grinned. He said, "You're asking for it. Really! You're *asking* for it!"

I returned his grin. "You interested in seeing what's under my skirt?"

"Damn right!" He stopped for a moment and put the shotgun down. "But don't get any ideas—I'm still turning you over to Tractor John."

I didn't say anything. The seam running up the front of my skirt hid a quartz-fiber tube. Inside, under high pressure, was half a gram of para-2-dyclate. It was triggered by two monofilament loops on either side of the seam. The effective range was just under two meters.

Panzer was still walking forward when it hit him. He just stopped walking and looked like he'd been struck by lightning. Then he began to fall, and I moved out of the way to give him room. He was dead before he hit the ground.

I slid the little knife back into my shoe, heard something, looked up. It was Choctaw. He was only twenty-five meters away, but his sides were working like bellows and there was agony on his face. No trouble there. I grinned, gave him a wave, and went the other way.

The Old-Timer was still lying on the sidewalk when I got there. A blood smear showed where he'd struck the concrete.

I put my jacket under his head, felt for his pulse. There wasn't any. Panzer had hit him *awfully* hard.

I was just standing up, the itch in the middle of my back telling me to move, when I heard the scrape of shoesoles. At the same time I caught a hint of color out of the corner of my eye.

"That's one of them!" A woman in a red dress pointed in my direction, her finger jabbing the air. "I saw her—running away!"

"Just stay right there, Miss," a deeper voice said. "Don't move. Don't look around. Don't do *anything*."

I glanced around anyway. There was a cop looking at me over the barrel of his Magnum.

The judge who handled my case was old. Seventy was my guess. He had a halo of white hair and his hands were starting to shake. But in spite of all that, he didn't seem to miss much.

When it came time for the verdict, though, I thought I detected a softening in his manner. Maybe he had a granddaughter somewhere. Or even a great-granddaughter.

He said, "Angela Hammond—*alias* Pony?"

"Yes, sir."

"I've heard the evidence. Is there anything you want to say before I come to a decision?"

"No, sir." There was, but it had all been said before, and either he believed it or he didn't.

"The facts are clear enough," he went on. "You were observed running from the scene of a crime.

Danger to your own person was alleged, but not verified; the body of the man you claim was pursuing you has not been found."

I clamped my lips shut. Of course not! By the time they'd actually gotten around to looking for him, Choctaw and the rest of the Outlaws could have carted Panzer's body all the way to the Grand Canyon and back.

The judge looked around the courtroom, tapped his fingers on the dais. He said, "It is to your credit that you returned, of course. And—however late—you *did* attempt to help. But that fact alone does not obviate your participation in a serious criminal act. I have no choice but to find you guilty."

I changed my mind about his having granddaughters.

He wasn't through, though. He leaned forward a little, looking down at me, his eyebrows making two white arches.

He said, "Young lady, I want you to know that those of us who choose not to undergo the Sykes-Ridgeway treatment are every bit as human as those who do. And we're entitled, I think, to live free of coercion and harassment. Simply because we grow old does not give others the right to threaten us." He stopped and peered sharply at me over the rims of his spectacles.

"You're fortunate," he said, continuing. "I'm going to give you a choice. Because you're young. And because there's a possibility you *might* still learn something."

I waited, sweat forming on my palms.

He said, "I sentence you to five years in the State Women's Prison." A pause. "The sentence shall be suspended in the event you complete three month's work in a Senescent-Center."

I said, "Thank you, your honor. What's a Senescent-Center?"

His smile was pure strychnine. "You can find that

out for yourself." He lifted his gavel and gave the gavel-stop a tap.

It was only later that I got angry. Justice—hah! Be a good Samaritan and what does it get you? A slam in the chops! I paced the floor of the holding cell and thought about it, bitterness riding up in the back of my throat. The judge was an Old-Timer, after all. He didn't understand S-Ridgers—how could he? I paced some more, and after about two hours a tiny still voice piped up. *It could have been a whole lot worse.*

I sat down on the bunk. True. The fact was Tractor John wouldn't have contacts inside a Senescent-Center. Not likely, anyway. And three months was still only ninety days long. The more I thought about it the better I felt. I laid back and rolled over.

I still didn't know what a Senescent-Center was.

I had never seen so many Old-Timers in my life. The place was packed with them.

Definition of a Senescent-Center: a pile of brick and mortar where hundreds of old folks hang around drooling and worse.

It didn't surprise me that *some* people didn't want to become S-Ridgers. After all, there were some religions that forbade it, and maybe one in a hundred applicants reacted adversely to the Sykes-Ridgeway treatment itself.

But I had never thought there was much of a moral question. The S-R treatment left you physically as you were in your mid-twenties. Who wouldn't want that? Right up to about eighty or so you had full control of your faculties. That beat what happened to Old-Timers.

I'd only seen a few real Old-Timers in the city. And just as well. When they got up over sixty-five they began to show their age in rather horrible ways. The flesh hung on their bones, their organs began to

fail, and then—finally—their minds went *ga-ga*. Better to be an S-Ridger. Live life right up to the hilt and then be done with it. It may be shorter—I'd heard some Old-Timers lived to be a hundred thirty or so—but what the hell, who'd want to be in their shoes? I knew one thing. As soon as I turned twenty-one I was opting for the treatment.

"It may surprise you," the intern guiding me said, "but we've lifted the average life span among Old-Timers to a hundred twenty-one." A little brass tag said the intern's name was George Guidry. He was short, with soft black hair and a long jaw. Enthusiasm gleamed in his gray eyes whenever he turned to look at me. "It's been going up each year. A hundred and fifty may be possible—someday."

Being in the place gave me the squeams. I pointed to an old man socked in a wheel chair. He looked like a vegetable rotting at the roots.

"How old is *he*?"

"A hundred and twelve." Guidry consulted a clipboard to corroborate his memory and then gave me a glance. "Believe it or not, we only have three residents here under a hundred."

"I believe it," I said, and looked around. Put all the facial creases end to end and you'd have a good shot at reaching California.

Guidry tucked his clipboard under his arm and headed down a corridor painted in shades of yellow and blue. I walked a little faster so that I came up beside him.

"Why aren't you raising the life span for S-Ridgers?"

"Different thing entirely," he said without slowing. "The S-R treatment actually changes gene structure. There *are* people working on it, though. So far they haven't gotten very far."

I started to say something and then thought better of it. Guidry turned into an area marked Intensive

Care, and stopped. He didn't say anything for about ten seconds.

"Clyde Dunfield," he said finally, softly. It was as though the name itself had meaning. He nodded his head toward the senes-station in the middle of the room. A battery of ceiling lights shown down on a sad little heap covered with a single blanket.

"He's a hundred and forty-one years old," Guidry murmured, glancing my way. "Think of it!" His eyes held awe—and something else. Pride, I guess. As if he, single-handedly, was stemming the tides of time.

I felt like throwing up. Dunfield's face was a pock-marked ruin. His forehead was mottled with brown spots. His cheeks had sunken in so far they were black caves on either side of his nose.

When I couldn't stand staring at him anymore, I turned and looked at Guidry. I mumbled, "Why don't you just let him die—and be done with it?"

He gave me a brooding look. It had ice in it. "Because," he said finally, enunciating the words carefully and leaving spaces between them, "he doesn't *want* to."

"You mean he's still right in his head? Really?" I gave the heap another look.

"He's lucid," Guidry said affirmingly. "And see there? That's a switch. He can turn it off whenever he chooses." There was a pause, and then he said quietly, "Is it so surprising, that he wants to live?"

When I didn't respond, Guidry gave a soft snort and turned away, his clipboard slapping his thigh. A few moments later, more calmly, he said, "Dunfield *has* died. Twenty or more times. So far we've managed to bring him back. We learn a lot that way—about the so-called 'near-death' experiences. Another pause. "You should talk to him sometime. He remembers before there was an S-R treatment. Before there was space travel, even."

It was hard to believe. But I wrinkled my nose and bit my lip and didn't say anything.

Guidry was called away at lunch time. When he came back he ordered a cup of coffee and sat down across from me, a speculative look in his eye.

He said, "You want to know what you'll be doing for the next three months?"

"Sure."

"Riding herd on a terminal. The man has a brain tumor—we give him six months tops."

I made a face. It sounded like ninety days of bed pans and spoon feeding.

Guidry pulled a piece of paper out of his pocket and gave it a glance. "His name is Leo Harte Smith. He's a hundred and seven years old. In the High Reach they call him Lionheart."

"What's the High Reach?"

Guidry stirred his coffee and looked musingly at me. "It's space jargon. Anything that hasn't been fully explored yet they call the High Reach. Smith was working the area between Mars and Jupiter—he's spent most of his life out there."

"Sounds dull."

Guidry shrugged and didn't answer. He merely sat and sipped his coffee and hid the smile that jerked at the corners of his mouth.

I was waiting in Smith's room when he arrived, trundling his luggage behind him on a come-along cart. He went contrary to my expectations of Old-Timers. He was a gnarled black gnome with hard bony features. An eyepatch covered his left eye.

"You Hammond?" he asked, guiding the come-along cart into the room. There was a strained, nervous look about him.

"Yes."

"I'm Smith." The old man grimaced as though in pain, but his movements didn't slow. He swung a bag off the cart and onto the bed. What hair he had

left was dirty white and close-cropped. His good eye, darting every which way, looked blood-shot.

"Happy to meet you," I said.

"Yeah? That's crap!" His response was made in flat angry tones. He slammed the empty cart into a corner and spun half around, skewering me with a glance. "I read your sheet, sis. You don't want to be here any more than *I* do."

"Well—"

He stared at me, cockily sure of himself, never for a moment doubting his place in the world. His gaze moved slowly, from my toes to the top of my head. I'm used to it, and usually I don't blush. This time I did.

"Humph. How old are you, anyway, girl?"

"Twenty."

He shook his head sadly, scratched the back of one hand with unkempt fingernails, and sank into an overstuffed chair. "Christ. I got calluses older 'n that." Then his head snapped up and his mouth hardened. "So where do you get off, huh? Killing people."

"*I* didn't kill that old man," I said indignantly. "*Panzer* did."

The old man's grin was brief, totally sardonic. "Okay—where's Panzer?"

I stopped and shifted my feet. He'd made his point—Panzer was dead. But he was *wrong*, too. Panzer would have taken me back to face Outlaw court, and *no*body survives that. I tried to shrug it off, but I could feel anger churning inside, leaving my armpits clammy, my jaw clenched and rigid.

He'd seen it. One-eyed he may be, but he didn't miss much. He looked at me a moment longer, a grin splitting his aged face. Then he leaned back and crossed his legs. He said, "I don't think we're going to get along together very well, do you?"

"So ask for somebody else," I yelled. And, involuntarily, the words slipped out: "—*You old bastard*!"

His good eye narrowed by half a micron and his body shook a little in the chair. After a two second pause, he said, "That'd be okay, sis. Except if I did that, you'd go straight to prison."

"I don't know how Smith found out," George Guidry said commiseratingly. "But he's right. If you don't finish the assignment you're to be sent straight to a correction facility."

We were sitting in Guidry's tiny office located off one of the computer labs. It had taken me most of the morning to track him down.

"But hell, George," I said as forcefully as I could, "he doesn't *want* me!"

"Not now, maybe." Guidry shrugged, bit at the stem of a pipe. "He will later. He's got a lot of drugs in his system. They tend to make him irascible." He glanced up, then tapped the pipe's bowl gently on the desk's surface. "The tumor is spreading pretty rapidly. They had to take out his left eye, you know."

I don't know why, but I had assumed he'd lost the eye out in space. Not that it made a lot of difference.

Guidry put the pipe, unsmoked, into a desk drawer. He said, "Anyway, you'll have to deal with the situation as you find it. Nobody's going to change the assignment."

I bit my lip. Five years in jail or eighty nine more days with Leo Harte Smith. It still came down to that.

The gnarled little man was noodling with the room computer when I got back. He'd pried off the cover and was making changes to the vocal-audio. Normally a computer voice is neutral male, primarily of Atlantic-seaboard origin. Wielding a screwdriver and a pair of tweezers, Smith had raised the register and

altered the pitch. I was impressed; he was damned good. Quick, too. In about three minutes he had it sounding female New Orleans, and seductive as all hell.

"Ah, you're back." He glanced my way and then dismissed me. One hand holding the computer unit mute, he tapped in the name B-o-n-n-y with the index finger of the other.

"Castrato," he said with an evil smile.

"Who's Bonny?"

"A whore I knew once. She was an S-Ridger, though; she didn't make it in the Reach."

"Why not?"

He moved away from the computer, dropped into an easy chair, swept the question aside irritably. "Where'd you get the name 'Pony'?"

"It's my street name."

"Uh huh." He interlocked his fingers and popped the knuckles. "You told the court you were being chased by some S-Ridgers call themselves Street Outlaws, that right?"

"Yeah."

He grinned mirthlessly. "Because you wouldn't pay extortion."

"That's right."

"You don't think that wasn't maybe stupid, given the circumstances?"

I could feel the blood rising in my cheeks. *Always*, the old man managed to make me feel stupid. He went for the soft spots, every time.

I clenched my jaw until I heard my teeth grind together. "Go to bloody hell!"

His weathered black gargoyle of a face split in two and he started to laugh. He said, "Take it easy. So far, that's the only thing about you I *like*."

I kept my mouth shut and sat down on an ottoman ten feet from him.

He returned my gaze for a full fifteen seconds

before breaking the silence. "You want to see what it's like in the Reach?"

"I guess—sure."

"Bonny!" He addressed the computer unit in authoritative tones, his single eye gleaming.

"Sir?"

"Give us a shot about two hundred meters off Dante."

The CRT flickered with light. A second or two later a string of random numbers marched across it from left to right. Then nothing.

"Dante is a classified space anomaly, sir." Bonny's electronic voice was just short of a coo.

Smith was outraged. "Hell it is! I *discovered* the damn thing!" He bounced to his feet and began punching keys. A moment later he bent double and screamed, his hands clutching the console apron as if it were his lifeline out of a dark pit. Finally, he fell, his head thumping hard against the keyboard casing.

I caught him before he hit the floor. *Seizure*—Guidry had told me to expect it, given me instructions on what to do when it came. I got Smith into bed and shot him up with painkiller, then massaged the muscles around his diaphragm, working my thumbs in until he grunted and slapped at me, trying to get me to stop.

"It's an asteroid," he muttered, his bony chest heaving. "A cinder about three kilometers through. I came across it fifteen, twenty years back." Sweat pooled in the hollows of his neck, ran down onto the bed.

"What's so strange about it?"

He managed a quizzical look. I waited a moment, and then started massaging again. "Damn thing's liquid at the core," he growled, his words coming out on little stabs of air. "That's not supposed to happen with anything that small." He paused for a second, his eyelid fluttering, his gaze on the ceiling.

"But that's the way it is . . . in the Reach. You just never know—"

"What did you mean, about Bonny?"

"Huh?"

"You said she didn't make it. You implied it was because she was an S-Ridger."

"Lot's of 'em out there," the gnarled little man said neutrally. He worked his tongue around in his mouth and spat out a wad of what looked like cotton. "Got any water?"

I put a pillow under his head and went to get a glass of water. When I got back he was breathing easier and looking less like a comatose spider-monkey.

"Well?" I said, reminding him of our conversation.

He sipped the water gratefully, leaned back against the pillow. "It's hard to put a finger on. S-Ridgers do everything *we* do—better, most of them. Coordination's twice as fine. They just don't seem to . . . *learn* as well. Bonny didn't, though she tried. It was as if she couldn't . . . accumulate enough life experiences. That make sense?" He looked at me worriedly. "No growth—she didn't *grow*."

My face must have told him what I thought of that.

Shrugging, he said, "I'm an explorer, a perimeter man. What I do depends upon risking my life and my ship. I won't have an S-Ridger ride with me."

"That's crazy!"

"Mebbeso." The gnarled little man shot me a glance that was more like his old self. "How old was Panzer, that Outlaw you put under?"

"I don't know. Sixty . . . seventy, maybe."

Smith nodded, cocking his head to look up at me. "That's the difference, I guess. You have to grow all the time, out in the Reach. Synthesize. Or it'll do you in." He knuckled sweat out of his good eye. Then he grinned. "Not down here, though. Not on Paradise. Hell—here you can still be a kid at seventy."

"Yeah," I said, and went to refill the water glass. He was making me uncomfortable again. Proof that he was pretty well recovered. One thing I knew for sure. I didn't want to be old like him. Not here on Earth. Not out there in space. Sykes-Ridgeway for me.

My bed was located in an anteroom. Close enough to hear Smith as he turned and thrashed around. The nights were too, too long. Often he simply lay moaning, the pain swallowing him as surely as a barracuda hits a fly. But he never called me. And he never talked about it, though sometimes in the morning there would be deep teeth marks on his arms.

Guts, the little man had.

"I'm an explorer," he said to me once, his black face devoid of expression. "That's what I regret the most. I would've liked to have died up there." He pointed his finger toward the ceiling.

"Why don't you?"

He grimaced. "They won't let me off-planet. I have a mini-O'Neill parked in lunar orbit. It'll stay there until I go—and then they'll tow it off." A look of indefinable yearning flashed across his face.

"Haven't you got any children?"

"Nope." He examined what was left of his fingernails. "Sunspots took care of that, a long time ago."

"Where would you go, if they let you?"

"The Reach, of course. Where else?" He stared at me, his eye deep-set, probing. "Up there is where I belong. On the perimeter."

He got worse. The tumor started to invade the limbic system, and he lost partial control of his arms and legs. I watched over him. Hell, in spite of myself I found myself *liking* him.

"Think you'll make three months?" he asked one evening.

"I think so."

"Think *I* will?" One corner of his mouth was turned up in that constant cocky grin.

"You'd damn well better," I said.

"Um." He gave a vague little shrug. "Never thought I'd have myself no honky angel." He reached for a glass of whiskey at his elbow, but his hand refused to lock around it; it crashed to the floor in a welter of pieces.

I said, "No harm done," and bent to pick up the shards. Then I got a look at his face.

Smith wasn't breathing, but he was trying to. The cords of the old man's neck were straining like violin strings. His torso was going in and out with the force of a pneumatic jack. Little whispers of sound forced their way up his throat and out his nostrils.

"Oh, God!" He weighed nothing. I pulled him out of the chair and onto the floor. He was suffocating, his own musculature crushing the life out of him. I ran my fingers down under his shirt, felt huge ridges of spasming muscle. Guidry hadn't told me what to do about *this*.

It took me two seconds to hit the big red emergency button located above the bed. They had a good staff but a busy one. If there were a free hand he'd be here on a dead run.

But in the meantime it was up to me. I straddled Smith's supine form, bent down, lifted his upper torso about three inches off the floor. I did it again. And again.

"Breathe, damn you!"

Somehow he got some air. He lay limp under my hands, our noses about twenty-five centimeters apart.

"This is no way to die," he murmured bleakly. "I should be out there . . . exploring."

"You aren't going to die."

"Who's going to stop me? You?"

"Uh huh."

He grinned weakly, saliva running down his chin.

"Anyway," I said, "why don't you take your own advice?"

"Uhm?"

"You say you're an explorer, why don't you explore . . . *death*?"

He stared at me as if I was crazy.

I knelt beside him, put a pillow under his head. "Think about it. Clyde Dunfield's died twenty times. What is it like, do you think? You should be able to go further than he has. Come back then and tell us. Jesus—talk about your High Reach!"

He closed his eye for a moment and then opened it again. He gasped, "You have a macabre sense of humor, Pony."

I shrugged. "It's the only game going."

Then the door burst open and there were half a dozen white coats all trying to get in at once.

"You could be right, you know," he said when they were lifting him onto a gurney. "It probably *is* the only game going."

"So what are you going to do?"

"Don't rush me, woman. Going to think about it, is what." And, a black raisin lost in a cotton field, he was pushed through the door.

He took me up on it. The last time I saw him was in the Intensive Care Unit. They were hooking him up to the life supports. He looked weak and tiny, his life forces driven far down toward their core.

"He gave me this," George Guidry said. He held out a sheet of paper scrawled in Smith's uneasy hand.

"What is it?"

"Far as I can make out, it's a will. He's leaving you his mini-O'Neill, if you want it."

I was walking back toward my room when I heard the commotion from outside. There was a bellow, a

shrieking scream of metal tearing, and then three or four muffled shots.

"PONY!"

I peered out of the nearest window. A small courtyard abutted the hospital. Normally its gate—of wrought iron bars—was closed. Someone had driven a ground car through it.

"PONY!" A figure stepped from behind the ground car, kicked at a limp form at his feet. He was impossibly huge, like a bear trained to wear clothes. A bandoleer crossed over one immense shoulder, and I caught the glint and shimmer of brass and gold.

Tractor John. Come to avenge his brother's death. He was alone, which meant he saw it as a personal vendetta.

"I know you're in there somewhere, Pony!" The big man kicked again and I realized belatedly a guard had tried to stop him. I hunkered down beside the window and watched as the Visigoth proceeded to demolish what remained of the guard shack. He used a micro-bazooka, and it took him all of thirty seconds.

"Come on out now, or I'll start on the hospital!" he bellowed. He broke the bazooka and inserted a reload.

The Senescent-Center was located fifty miles from the nearest city. That meant police protection was virtually nil. Still, someone *would* have called them. That gave Tractor John maybe half an hour. Which was all the time he would need.

The guard from the rear of the Center came into view, stepping gingerly through the remains of the gate. Tractor John dropped into a crouch, the bazooka resting on his shoulder.

The guard made the mistake of drawing his pistol. The bazooka *war-umphed* loudly, sending a jet of fire out behind the Visigoth's head. The guard vanished, as did the remaining section of the gate.

"PONY!" Tractor John turned his attention again to the hospital.

I didn't do anything for maybe three or four minutes, just sat while Tractor John strode up and down like a disgruntled god and vowed vengeance on my head. Then he blasted a three meter hole in the roof of the building closest to him and started reducing the whole thing to rubble.

It was time to make a decision.

The thought no sooner crossed my mind than I realized I'd already made it. Somewhere back there—*damn him!*—Lionheart Smith had left an indelible mark on me. Not because he'd preached, but because he hadn't. I believed him. S-Ridgers were somehow people who didn't really grow up. Looking out at Tractor John, it was easy to believe. Dangerous he might be, but there was an indisputable silliness about him, too. A comic-opera villain with teeth.

The villain blasted off a cornice on the next building and I stood up. That was the building that housed the Intensive Care Unit. I didn't want anything to happen to that unlovely little gnarled black man.

Besides, Tractor John was standing in my way—my way to the stars.

I took a step outside.

Maybe he'd be interested in what's under my skirt.

EDITOR'S INTRODUCTION TO:

THERE IS A TIDE

It's been a while since Retief has graced the pages of a science fiction magazine. Not that he wouldn't have been more than welcome, but for Retief, as for all of us involved in publishing, the money has been in novels.*

As no one who has read them can be unaware, Retief's adventures have been an ongoing metaphor for U.S. diplomacy. In the old days, when America was very strong, there was a certain light-heartedness in the galaxy's only two-fisted diplomat that is no longer quite so evident. Maybe that's because giving up slack through silly bumbling doesn't seem like a real big deal when you have seemingly infinite amounts of the stuff.

These days, though, thanks in large measure to the very shenanigans lampooned in the Retief stories of an earlier period, we no longer bestride the globe like a Colossus, and in his more recent Retief adventures the humor is a bit more savage and the "They're idiots, but they're our idiots" attitude of a protective Retief has become tempered with the unspoken awareness that the silly bastards are doing us real harm. . . .

—JPB

*But wait! Could it be that series characters sell as well in the linked-novella format as in the longer form? One publisher, at least, thinks so; "There is A Tide" will next see print as one of three linked novellas to be published in 1987 by (surprise!) Baen Books.

There Is A Tide

Keith Laumer

As Second Secretary and Consul Jame Retief approached the dowdy façade of the Embassy of Terra, a cluster of Slubbese locals who had been closely grouped around the Embassy limosine, a replica 1931 Bugatti *Royale*, abruptly dispersed and assumed casual saunters, a ploy rendered nugatory by the cloud of dense purplish smoke issuing from beneath the classic vehicle. Retief went to it, stooped, reached under to detach a small smog-bomb of Groaci manufacture which he tossed into the nearest refuse bin. Then he went quickly up the steps in time to intercept a smallish alien in tight tan khakis and engineers' boots as he attempted to exit the building via the narrow window-well lighting the spare vault.

"To unhand me instanter, Retief!" the Groaci yelped. "I was just rushing to put out the fire!"

"It's under control, Whish," Retief told his struggling captive. "But what were you doing in the vault?" He glanced through the barred slit and saw heaped

cartons marked with curlicue Groaci script: *Secret—spy equipment* and *touch at your peril!*

"To have but delivered a token of His Groacian Excellency's esteem to his colleague, Ambassador Hairshirt!" Whish declared vehemently. "But to what avail these gestures of civilized regard between diplomats, in the face of such brutality?"

"Oh, we haven't gotten to the brutality yet," Retief corrected the Groaci. "Let's go see His Terran Ex and find out how he feels about messengers of civilization who pay a crowd of loafers to booby-trap his precious Bugatti."

"Have a care, rash Terry," Whish keened in an attempt at self-assertiveness which Retief dispelled by shaking him as if to dislodge foreign particles. Inside, he left the Groaci in the charge of the Marine guard and went upstairs.

In the conference room, Ambassador Clarence Hairshirt looked coldly along the conference table at his assembled staff.

"What General Faintheart has to tell us, gentlemen," he began as soon as he had accorded a chill glance to Herb Lunchwell, the plump Econ Officer and last to arrive, "is nothing less than a Class A breach of solemn interplanetary accord . . ."

"Yeah," the general took up the account, "which that sneaky Groacian Admiral, Thinth, under the guise of outfitting an aid station, has went and fortified Big Moon into a regular Fortress Luna. And right under your noses, too," he added. "So now we're looking down the muzzles of about nineteen batteries of Thunder-guns while we try to negotiate with Groac on the trade-lanes question and all. Kind of gives 'em a like psychological advantage, know what I mean?" The sour-faced general looked defiantly at the civilians. "Which, if I would of been shipped in here a couple of years sooner," he declared, "it wouldn't of happened."

"Aside from the question of rearranging history, Fred," Hairshirt responded mildly, after a strained silence broken only by throat-clearing along the table, "We have the *de facto* situation with which to deal. Now, in view of Groac's preemption of the major satellite, what can we do to normalize the balance of power? I am open, gentlemen, for suggestions. What about you, Sid?" He impaled the luckless Assistant Political Officer with a glance half amused, half challenging. "What action would you, in my position, take?"

"Would I in your position take?" Sid gibbered, taken off guard. "Well, sir, first I guess I'd get off those gold-embossed invites to the reception—just to show that everything's cool—and then, ah . . ."

"Your proposed strategy will be duly noted, Sid," Hairshirt stated in a tone which encouraged no fantasies of early promotion. "Now," he went on, as one Getting Down to Business, "I summoned you here to consider a more immediate matter which has come to my attention, to wit: a firm rumor that the Groaci Deep Sea Drilling Project is more than it appears. I have been informed by a Usually Reliable Source . . ."

"Oh, you mean George, the janitor," Sid put in, eager to remind his chief that he, too, was In the Know. "Sure, Georgie and I had a nice chat last night, which he heard from the local sweeper staff they had it on good authority that the word in the street is, the Groaci sneaked a Class One hell-bomb in here to Slub under cloak of diplomatic privilege and all. Heck, sir, that's nothing new."

"New or old, Sid, a contraband Hell-bomb on this virgin world is not to be lightly disregarded," Hair shirt reminded his victim.

"Sure, sir, I only meant, heck, it's easy to believe Yer Ex has got the straight dope, seeing it happens all the time. I mean, why start a dumb rumor like that if there's nothing in it, eh fellows?" Sid looked

brightly along the table for signs of support, encountered only stony looks plus a stifled yawn from Hy Felix.

"In the interest of getting on with the solution of the substantive problems confronting this Mission," Hairshirt stated glacially, "I shall for the nonce overlook the mainfold deficiencies in your attitude toward Ambassadorial Infallibility, Sid. Now," he changed the subject abruptly, directing a swift glance along the table to note the reactions of his staff, "What about this Hell-bomb, eh?"

Brigadier General Freddy Faintheart, the Military Attaché, rose to his feet. "That can wait," he dismissed his Chief's query. "The Number One priority is Big Moon," he declared. "I'm quite convinced," he went on, "that the rascally Groaci, under the cloak of providing an emergency aid station, have installed a full-fledged combat operations facility on the satellite."

He glared along the conference table as if daring anyone to contradict him. "The evidence is incapable of misinterpretation," he grumped. "Not only that," he went on, "I have spy-satellite data indicating that a full field force of the Groacian Navy is emplaced there as well, fully manned and equipped! This, gentlemen, means *war*!" the general subsided, looking triumphant, but was rebutted by the Ambassador.

"Provided, that is, Freddy, that I do not simply decide to give Slub up as a bad job and recommend breaking off relations in time to avoid direct Terran involvement in the coming holocaust."

"But, sir," a youthful Third Secretary objected. "That would be pusillanimous in the extreme, to simply run away and leave poor, backward Slub to her fate. After all, we *do* have a Most Favored Planet relationship with her."

"What Wilbur means," a portly Econ type put in quickly, "is that certain irresponsible elements of the

yellow press, inspired by traitorous motives and paid by Entrenched Interests, might misinterpret Your Excellency's noble motives."

"Sure, I know all that stuff," Ambassador Hairshirt cut off the rescue attempt. "But it's time you learned, Wilbur," he fixed a flinty gaze on the lad, "that in most 'relationships', as you so naively term Terra's solemn diplomatic understanding with this benighted pest-hole, somebody gets, ah, is recipient of an act of copulation, shall I say, and I don't want it to be me—Terra, that is."

"Sure, sir," Wilbur acceded brokenly. "I only meant about the yellow press and all, like Mr. Lunchwell said."

Hairshirt shifted his eye to a slender, narrow-faced chap half concealed behind Retief, a tall, broad-shouldered Second Secretary and Consul assigned as Assistant Political Officer, and said, "Magnan, I'm taking a chance on you. I'm assigning to you, and your assistant, of course, the little task of dealing with this arrogant violation of solemn treaty by the scurvy Groaci. In spite of a number of unflattering comments in your record by your former Chiefs of Mission, I want to give you this chance to redeem yourself."

"Gosh," Magnan, the Political Officer, said, "that's big of you, sir. I'm sure Retief appreciates the honor as much as I do."

"That's good, Ben," Hairshirt said in a tone as kindly as that of an executioner inviting his victim to utter his last words. "Because if you didn't, I have the help wanted pages of the Slubbese *Morning Dagblad* handy."

"Oh, I see, sir," Magnan quavered. "It's a little joke, ha ha."

"This is hardly the time for japes, Ben," Hairshirt rejected the attempt at levity. "By the way, Retief,"

he went on, changing sights, "had you been a millisecond later, you'd have been late to Staff Meeting."

"Curious, isn't it, Mr. Ambassador," Retief replied easily, "that one can be later, or even latest, without being late."

"Your apology is accepted," Hairshirt snapped. "What delayed you?"

"I noticed a local citizen planting a smoke-bomb under the official limousine," Retief explained. "I stopped to recover it."

"Cheeky locals!" His Excellency snapped, mottling. "Another of their confounded Booch Day pranks, I suppose, designed to panic me, since they know how I treasure my Bugatti. Good show you nipped the gambit in the bud."

"But worse is to be expected, Mr. Ambassador," Wilberforce, the Cultural Attaché cried, rising. "It's traditional that the finest Boochers always conceal a jape within a jape; that is, one practical joke distracts attention from the arranging of another, larger jest. So we'd better be prepared, sir, is what *I* say, Mr. Ambassador."

"Nonsense, Willy," Hairshirt boomed jovially. "They love me far too well to plan any such chicanery directed against the dignity of my Mission. Still, Retief, it wouldn't hurt for you to go check once more on the Bugatti, just in case."

As Retief left the room, a clerk from the Message Center hurried in with a grubby envelope which he handed to the Ambassador, who slit it open, extracted a sheet of re-used paper and scanned it quickly.

"Well, what's it say?" Hy Felix demanded.

" 'The bomb' " Ambassador Hairshirt began portentiously, "will detonate in approximately . . ." he paused to examine the genuine Minnie Mouse watch strapped to the underside of his plump wrist, ". . . .twenty-three—no, make that twenty-two seconds from*now*!"

"You never said anything about any bomb, sir," Hy Felix charged.

"And might one ask, Mr. Ambassador," the Budget and Fiscal man inquired diffidently, "just how it is your Excellency knows precisely when the thing is due to go bang?"

"Certainly, Hector," Hairshirt replied kindly. "The note said so"

"Maybe it was lying," someone suggested.

"But why impute a diminished capacity for veracity to someone you haven't so much as met, Clarence?" His Excellency reproved mildly. "Hardly the diplomatic way, eh?"

"Twenty two—or one, now, I guess, seconds. That hardly affords one time to evolve a rational evacuation plan," Ben Magnan pointed out, "to say nothing of finding and disarming the infernal device. . . ."

"Yes, as to that, Ben," Hairshirt cut in impatiently. "It hardly encourages one even to begin any long sentences. Action is what we need now, gentlemen, not words."

"Still, sir," a pudgy Second Secretary from the Economic Section put in doggedly. "One *does* hope that a trifle of rational verbal analysis will assist us in determining the correct action. Like finding the bomb, for openers."

"Yeah," Hy Felix, the Information Agency man put in. "do you have any idear where it's at, Mr. Ambassadore?"

"Hy," Hairshirt began in the melancholy tones of an indulgent parent rebuking an errant offspring. "I am not an avenue of entry or egress. The word is Ambassa*dor*. And have you not yet learned," he bored on. "that I, as your Chief of Mission, make it my business to be aware of matters within the sphere of my responsibilities? 'Any idea?', you ask. I assure you that I know precisely where the bomb is."

"That's just what *I* was saying," Magnan interjected

urgently, not directly addressing His Excellency, precisely, but setting the record straight for posterity, so to speak. "I said 'finding and disarming' it, remember? So if your Excellency knows what it's at, why don't we *do* something, instead of standing around jawing?"

"*Do* something, you say, Ben?" the Ambassador Extraordinary and Minister Plenipotentiary echoed in a tone which did little to elaborate on the thesis. "Would you expect me to abandon time-honored diplomatic procedures at the first hint of danger, sir?"

"Not exactly, Mr. Ambassador," Magnan explained. "Just sort of suspend them, or at least compress the conversational phase in the interest of getting rid of the bomb before it goes off in. . . ."

"What Ben means," Felix interjected, "is let's cut the chin music and ditch the bomb."

"Twelve seconds, precisely," Hairshirt supplied smoothly. "I am saddened, Ben," he went on, "to find that a Foreign Service Officer of Class One, whom I had been personally grooming for assignment as my Counselor of Embassy, would so lightly propose dispensing with chin-music, as you so colorfully characterize your Chief's briefing—a measure calculated, Ben, directly to attack the role of diplomacy in the postponement of the inevitable Galactic holocaust."

"I never said 'chin-music'!" Magnan blurted. "That was Hy."

"So it was," Hairshirt acknowledged. "But surely the matter of attribution is of less importance than my principle thesis, to wit. . . ."

"OK, if you know where it's at," Colonel Underknuckle, the Assistant Military Attaché, overrode his Principle Officer's comments, "tell us! Show me where to find it, and. . . ."

"And what, Teddy?" Hairshirt cut in encouragingly.

"Are you volunteering to smother the blast with your body?"

"Heck, no!" Ted denied emphatically. "But we can at least. . . ."

All heads turned as the door to the conference room opened and Retief reentered the room, gripping in one hand, by his slender neck, a spindly Groaci wearing a replica of an antique Western Union uniform embellished with plain olive-drab shinguards and plastic dime store eyeshields. As half a dozen questions rang out simultaneously, the newcomer went directly to the head of the table, picked up the Ambassador's briefcase, and took out a square package in colorful gift wrappings, jostling the AE and MP slightly in the process; he handed the packet to his prisoner, who threshed to avoid it, until Retief tucked it under the alien's Sam Browne belt.

"Three seconds left, Whish," the big man told the reluctant Groaci. "Better not waste any more time."

"To see a just and dispassionate revenge taken on your dying corpse, Retief!" the alien hissed. "To tell Uncle Shish how you Groaci-handled me right in the lobby of the Terran Mission to Slub!"

"Not unless you make the correct decision right now," Retief countered.

Whish moaned piteously, and without further resistance, ripped open the gaudy paper wrappings of the parcel and probed with a bony finger through the opening while all eyes watched in fascination. There was a crisp *click!* from within the box, causing three of the observers to dive for shelter beneath the table, the Ambassador securing the most favorable position as his underlings yielded pride of place to their Chief.

". . . and dunk it in a bucket of water," Ted Underknuckle's voice rang out clearly. He stepped in briskly to reach for the package, then changed his mind and stepped behind Nat Sitzfleisch, the portly Admin Officer.

"Thank you, Whish," Retief said, and dropped the undersized fellow, who at once lunged in the direction of the door, only to rebound from Ted Underknuckle's foot.

"One moment, fellow-me-lad!" the colonel said sternly, as he recaptured the Groaci. "This bears looking into. Now, just what do you know about all this, eh? Tell all, there's a good fellow, and I shall attempt to do what I can for you at the trial. Go ahead, Retief, tell us about him."

"When I went downstairs just now," Retief told the colonel, "I noticed Whish sneaking out by a side door. Since I'd left him under guard earlier, I grabbed him."

"And how did you deduce. . . ." Ted started.

"I didn't have to deduce, Ted," Retief replied. "I asked him, and after a few seconds he told me."

"Seconds," Whish put in in his shrill whisper, "which will live in infamy, once I tell Uncle Shish about how you repeatedly tossed me up and barely caught me before I impacted the floor!"

"And?" the colonel prompted.

"He mentioned delivering a bomb addressed to Ambassador Hairshirt," Retief explained. "So it seemed well to bring him along to disarm the gadget."

"Time's up," Hairshirt said with finality from his position under the table. He put his head out, twisting awkwardly to look up at Magnan. "Ben," he asked quietly. "Did you hear anything? After the final *click!* as the fuse tripped, I mean."

"That was Whish disarming the bomb, sir," Magnan explained, attempting to assist the Great Man to his feet, and simultaneously avert his eyes from his chief's undignified situation, and as a result causing Hairshirt to trip over Ted Underknuckle's foot, retaining his balance by executing a clumsy *plié*.

"Ben, will you kindly stop babbling about wishing someone would disarm the bomb?" Hairshirt de-

manded excitedly. "And precisely what explanation have you for this attack on my person? Gone made with terror, have you, Ben? Pity. Won't look at all good in your ER."

"Hardly an attack, Mr. Ambassador," Magnan disputed hastily. "I was just assisting Your Excellency to his feet, ah, your feet, that is,and you tripped over Ted's size fourteens."

"Size twelve, double E, Ben," Ted corrected coldly. "And had you not thrust His Excellency so vigorously, doubtless he would have retained his balance."

"We'll work all that out later," Hairshirt cut short the dispute. "Right now I want an explanation for the fact that we're still alive—or dead and dreaming I'm alive," he amended. His eye fell on Retief.

"You, sir! I dispatched you on an errand! Why are you standing there?"

"But it was Retief who brought Whish up here to disarm the bomb, sir!" Magnan advised the Ambassador hastily.

"Ben—stop babbling about what you wish," Hairshirt commanded. "As for the alleged bomb, clearly it was a hoax." With a dismissing forefinger, he prodded the torn paper-wrapped carton now lying neglected on the table. "Otherwise, it would have gone off five seconds ago, or more." He fixed Retief with a steely, though slightly bloodshot eye. "Have you any possible explanation for this lapse, sir?" He demanded.

"Sure, Mr. Ambassador," Whish volunteered breathily, but clearly, in his heavily-accented Terran. "He was late because he was busy using excessive force on a Groacian national enjoying diplomatic immunity here on Slub! Darn near squashed my bope-nodes, too," the alien finished, fingering his stringy neck tenderly. "And him three times bigger'n me, and me the favorite nephew of your very own colleague, His Excellency Ambassador Shish!" With

that he darted under the table, eluding the colonel's grab.

"Have you some explanation, Retief, for this breach of decorum?" Hairshirt demanded in a deceptively lazy tone, jotting a note as he spoke.

"Probably just racial prejudice," Retief conceded unconcernedly. "I'm inclined to be suspicious of any Groaci I see lurking around the Chancery."

"Lurking, indeed!" Whish sneered, poking three of his five stalked oculars above the edge of the table. "I waltzed in like I owned the joint, and the dumb guards on the gate never even looked at me! I rode the lift up with Oscar Turnbuckle from the Political Section, and all he done was say 'To have a nice day,' in lousy Groacian, too."

"It occurs to me, gentlemen," Colonel Underknuckle spoke up from a kneeling position as he dragged Whish from his retreat, "that these Groaci explosive devices usually have a back-up detonator, in case the primary fuse is somehow disarmed—it would be set to go any time in the next six hours. Let me see that thing: if there's an electric hum at about twelve thousand cycles, it means she's still hot." The others scattered from his path as he rose and went to the suspect parcel and held it to his ear for a moment. "Yep," he replied in a satisfied tone. "She's alive, all right."

"Then whatever shall we do?" Magnan dithered. "Before, we at least knew when to expect the blast, but now—all is uncertainty again."

"Let's throw it out the window," Sitzfleisch suggested, reaching for the package.

"And blow half the façade off the Terrestrial Embassy?" Hairshirt demanded, interposing his bulk. "To say nothing of the slaughter of some dozens of innocent passers-by. Very poor for Slubbese-Terran relations, Nat."

Retief went to the closet beside the washroom

door and returned with a bent coat hanger. He took a turn of the wire around the bomb and secured the other end to the frantically struggling Whish's neck. "I think he'll want to tell us something," Retief commented. "Let's lock him in the spare vault until he's ready."

Whish twisted in vain to free his neck of the wire.

"Vile miscreants!" he hissed. "Have you no compassion for youth and beauty?"

"As soon as you tell us about the back-up, or neutralize it yourself," Hairshirt told the disturbed fellow, "I shall see to it that steps are taken with all deliberate haste to defuse you, remove your person to a more comfortable situation, and notify your uncle of your whereabouts."

"Yeah," Nat added. "Shackled to the wall in our detention tank, eh, Mr. Ambassador?"

"To release me at once!" Whish hissed, more confidently now. "To temper my report to Uncle Shish, if you make amends instanter!"

"Looks like it's not going up right away," the scholarly-looking Cultural Attaché suggested. "He's not in a big enough hurry."

"To lack completely the spirit of the occasion!" Whish demanded. "To fail utterly to conform to local custom! To predict harsh treatment of the contretemps in the local press!"

"I should think the local press would rejoice that they didn't have a bomb crater where their best street used to be," Colonel Underknuckle put in. "To say nothing of a flotilla of Terran Peace Enforcers inquiring into the slaughter of an Embassyful of harmless Terry bureaucrats."

"But it's Booch Day here on Slub!" Whish keened. "A festival honored by every Slubbese, regardless of caste, age, or political alignment! Big shots, too. Even school kids. It's the day when the usually sup-

pressed Slubbese love of fun is released for full, free expression!"

"I wondered why those fellows were setting the Embassy limousine on fire as I came in," Herb Lunchwell, the plump little Econ Officer commented tonelessly.

"What!" the Ambassador yelled and rushed to the nearest window. "Blowing up a building of no particular distinction is one thing," he muttered. "But putting the torch to a work of art . . ." he broke off with a whimper. "But that's right—Retief removed the device, Herb," he added. "There she sits as lovely as ever! Gosh, it's almost worth the scare, to feel such relief!" He turned to embrace the portly clerk.

"How did it happen you failed to correct the situation yourself, my boy?" he cooed in tones implying Advance Foregiveness of Human Error (42-d).

"Gee, sir!" Herb burbled. "Never thought I'd rate your 42-g, Mr. Ambassador!"

"That was my 'd', Herb," the Great Man said kindly. "Now you'd best get back to your semi-annual requisition, eh?"

"And not get to see what you do with the bomb, sir?" Herb protested. "Heck, the old requisition can wait another few minutes, I guess. Anyway, my mind wouldn't really be on my work with that thing still ticking away."

"More of a hum, Herb," the Military Attaché put in.

"Hum, schum," Nat commented in a stage whisper. "In maybe a couple minutes or so, we'll all be corpses, the messy kind, from all kinds explosion. And these schmendricks want to stage a debate it's a tick or a hum, already."

"You still here, Herb?" Hairshirt inquired in a tone of Mild Surprise (166-d).

"Sure, sir," Lunchwell confirmed readily. "I said

about how the bomb makes me a little nervous and all, you know."

"Your gambit seems not to have been successful, Mr. Retief," the Ambassador commented, transfering his attention to the latter. "The bomb remains to be neutralized."

"If we stuck him in the spare vault, wired to the bomb, like I said," Ted Underknuckle put in, "I bet he'd get busy on it."

"To do your worst, vile Terries," Whish suggested calmly. "To await my fate with equanamity, knowing I am to take a roomful of the enemies of the Groacian state with me."

"Only you're not going anywhere, eh, Whish?" Retief addressed the wizened Groaci. He removed the parcel from the alien's neck and stripped away the colorful paper to reveal a dun-painted box. He handed it back to Whish. As soon as the messenger touched it, the lid snapped open, deploying a grotesque head at the end of a long spring, causing the Groaci to stumble back with a yelp, dropping the box, which at once began to play *Tenting On the Old Campground* slightly off-key.

Quickly regaining his composure, Whish hissed, "Do you hope thus to unnerve a reserve lance-corporal of the twelfth Zouaves? Fie! Enough of this zorchplay and on to matters of substance!" With his foot he spurned the fallen box, even as it wheezed its final melancholy notes.

"You're too modest by far," Retief commented. "We're aware you're a major in Intelligence." Then, turning to His Excellency, "Mr. Ambassador, I suspect that all this nonsense is a diversion designed to keep our attention from something more important."

"Good thinking, Retief," Ted Underknuckle said. "My idea exactly. And it's the Groaci machinations on Big Moon our attention is being diverted from."

"One wonders," a frail Secretary from the Political

Section murmured, "if there could be any significance in the smoke issuing from beneath the table."

"Just a wastebasket fire Whish started while he was there," Retief pointed out, as he doused the flames with a jet of charged water from the Ambassadorial seltzer bottle.

"Here—that's my genuine Nehi you're wasting, sir!" the Ambassador objected. Retief handed him the ornate flask, at the same time directing a final jet at Whish's upturned face.

"Mr. Ambassador," Magnan addressed his chief quietly. "I have a feeling that it would be a good idea to adjourn this meeting to another place—the subbasement, perhaps."

"May I inquire," His Excellency responded in tones of Righteous Wrath Restrained by Innate Kindliness (721-h), "What prompts your curious proposal, Mr. Magnan? Ah, you used to work for Herb Lunchwell, I believe, in GSO or whatever? Perhaps you'd best hurry along and assist him with the semi-annual. Can't afford late submission, of course. My stocks of blank Foreign Office Notes, for example, are perilously low."

"According to the Post Report, sir," Magnan spoke up, "this Booch Festival is dedicated to practical jokes designed to disguise other, more devious pranks. The more layers of deceit, the more points the japester acquires. As I was just commenting to Retief—or rather he was suggesting to me—we've only experienced about one and a half levels of Slubbese high spirits so far, so there's probably more and violenter to come."

" 'Violenter', Ben?" Hairshirt echoed. " 'More violent' might, I venture to suggest, be a happier locution, though your—or Retief's—point is well taken." He shifted his gaze to Whish, now cowering behind a bookcase near the door. "What about it, Whish?" he boomed heartily. "Anything else up your figura-

tive sleeve? By the way, Retief," he added offhandedly, "you'd best look into this business about Big Moon Ted is so upset about."

"Me, upset?" the colonel echoed. "It's to laugh, with respect, Mr. Ambassador. Like a cucumber, that's me. I merely did my duty in reporting a grave threat to Galactic Peace, with a copy to Sector, of course. What your Excellency decides to do about it, or not do about it, is entirely your own affair."

"Sector, eh, Ted?" Hairshirt mused. " 'Not do about it', eh? Did I say anything whatsoever about not doing something about it? Have you gone mad, Ted? Do you wish never to exchange these rather tarnished eagles for bright, new stars?"

"Stars!" the colonel yelped. "Cripes, sir, I figgered coming up with the dope on a *faux pas* o' this size, ahead o' Sector, which we would be the first to report and all, would cinch the old promo!"

"To be sure, Ted, I'm getting off a dispatch today with full details. I shall make it a point to mention you by name. Meanwhile. . . ." the Great Man turned to Retief. "Skip the semi-annual. Drop everything and look into the problem on Big Moon. I shall consider that my first priority. But as for Whish, here—any more surprises in store, major?"

"To wait and see!" the Groaci keened. "To soon discover, with no need of lengthy exposition on my part."

"Oh," Colonel Underknuckle put in. "So you admit it."

"To admit nothing, vile Soft One," Whish came back harshly. "To proclaim it!" Three of his eyes tilted toward the nearest open window, prompting Ted Underknuckle to hurry there precisely in time to be engulfed in an opaque cloud of yellow smoke jetting from an unseen source outside. Instantly, Whish darted around the Military Attaché and into the billowing fumes where he was lost to sight. Retief

went to the door, found it solidly blocked from the outside; he went on to a window from which he could see the agile Groaci hastily descending a rope to the street below, where a crowd of curious Slubbese stood staring upward. Retief stepped out onto the ledge below the row of windows and, flat against the nubbly stuccoed wall, made his way across to the rope, which he promptly descended, to be accosted at once by a bigger than average (five-foot) Slubbese sub-humanoid in a baggy olive-drab uniform adorned with insignia indentifying him as a constable in the City Police. He appeared to be holding something behind his back.

"What's up, Terry?" the cop demanded.

"The Ambassador's blood pressure," Retief replied crisply. "It appears the Terran Chancery is under attack." He reached around the cop to grab Whish by one arm as the latter lunged to free himself from the officer's grasp.

"It won't be necessary to hold Whish, officer," Retief told the constable as he in turn grabbed for the Groaci and received a kick in the shin for his trouble.

"Hey, that's *my* pinch!" the baffled constable yelled, pausing to rub his lower limb while balefully eyeing Whish, now cowering behind Retief.

"Now, Retief, you wouldn't turn me over to this vascular-juice-thirsty alien, would you?" the captive queried tonelessly.

"To be a good idea to save the invective for later, after your trial," Retief suggested in accent-free Groaci.

"To invoke diplomatic immunity!" Whish shrilled.

"To get off a stiff Note from His Terran Excellency to the Slubbese Foreign Office early next week," Retief promised.

"But this barbarian is poised to rend me asunder instanter!" Whish objected. "To crave the boon, Retief, of action more precipitate than normal bureaucratic

process! In fact, to get the heck out of here before that mob . . ." he broke off to eye the growing circle of curious locals . . . "hears somebody say 'lynch'."

"Lynch?" a bystander picked up the term at once. "Who—the noisy little one, or the big one that's holding him?"

"Neither one, dopey—the cop," someone explained impatiently.

"Wow! Lynch a cop!" the phrase echoed quickly across the now definitely excited crowd.

"OK, you're unner arrest!" the beleaguered peace officer yelled.

"Who, me?" inquired the same echoic individual who had launched the lynch rumor. "What for, chief? I ain't done nothing, only that little caper last month at the Civic Club. . . ."

"That was *you* put the socks in the Cop Night stew?" the cop yelled, reaching. In a trice he had the cuffs on the unfortunate trickster. "And a full week before Booch Time, too," he added. "Yawtta be shamed."

"I am, chief, I am," the shackled Slubbese assured his captor.

"Clear the way there," the cop shouted, thrusting his pinch ahead of him.

The crowd gave ground reluctantly. Retief waited until ranks had closed behind the constable, then said to Whish, "Let's find a quiet corner where we can have a heart-to-heart talk."

"Quiet corner, indeed!" Whish hissed. "This hick town was a disaster area even before their confounded Booch Festival turned disorder into chaos. How about the Pink Moon, just around the corner, back of the Yalcan Legation."

Retief agreed, and moments later they were occupying a booth in a shadowy corner of the seemingly moribund establishment. An elderly Slubbese waiter came shuffling over, sighing audibly. He was a pear-

shaped being with pale, wrinkled lavender skin and a fringe of faded purple hair above his bleary pink eyes. He was dressed in a baggy puce and mauve coverall. He had short, bowed legs and shoulderless arms.

"Make that a hot fudge sundae and a stiff shot o' Bacchus brown," Whish ordered curtly. "And put some snap in it, pal. I got a tight schedule."

"You wanna sign this-year waiver?" the old fellow inquired in a once-gravelly voice now grown squeaky, offering a dog-eared paper.

"Nix," Whish snapped, thrusting aside the proffered document. He canted an eye at Retief.

"Prolly a perpetual lease on the joint in the fine print," he explained. "Especially during Booch, you know, these clowns will try anything."

"Speaking of trying things, Whish," Retief replied as the waiter went away, muttering. "Who sent you to the Embassy?"

"What, *me*?" the Groaci squawked, his throat sac vibrating in indication of Extreme Agitation Brought On by Baseless Accusation (417-c).

"Don't waste that 417 on me," Retief said. "I don't think you were in business for yourself."

"Do you not?" Whish hissed. "In the spirit of joyous Booch, may not a humble worker in the vineyard get to bring a modicum of the season's spirit to his fellow bureaucrats?" He broke off to tilt an eye in the direction in which the elderly servitor had disappeared.

"All just boyish high spirits, eh?" Retief inquired casually. "Then tell me about the rope and the smoke-bomb to cover your departure."

"Why, as to that, the explanation is simplicity itself," Whish improvised. "A mate of mine, one Thilth, of the Econ Section as it happens, just happened to be gathering zitz-bugs on the roof, for his vermin collection, of course, and. . . ."

"Skip it," Retief suggested. "I already don't believe it and I haven't even heard it yet."

"Poor old Thilth would do well to reserve space in his specimen drawer for a small Terry," Whish whispered as if thinking aloud. Then, "Oh, surely one can simply overlook this morning's contretemps, Retief. As. . . ."

"Oh-oh," Retief cut him off. "Here comes the old 'fellow diplomat' pitch. Funny, you Groaci are overwhelmed with fraternal emotion only when you've been caught with your sticky fingers where they shouldn't be. I wonder why."

"That's simple enough, Retief," Whish replied, leaning forward earnestly. "You see, if I can shrewdly engender a bit of empathy in your assesment of my activities, you'll be inclined to take a more lenient line." The glib fellow leaned back with the air of one who had revealed an astonishing secret.

Retief nodded. "The question was rhetorical," he pointed out. "Now let's get back to who sent you, and why."

Whish spread his spatulate, suction-cup-tipped hands. "I already told you it was my own idea!" he keened. "Mere boyish high spirits, like you said," he amplified. "An impulse, nothing more."

"Too bad your impulses are so well rehearsed," Retief commented. "I might buy the jack-in-the-box bomb impulse, but impulsively preparing a rope for the getaway and a smoke-bomb to cover it are just a bit too studied to carry real conviction as boyish impulses."

"Drat!" Whish muttered. "I *told* that know-all. . . ."

"But you forgot to put it in writing," Retief pointed out. "Or did you?"

"Heavens, no!" Whish snapped, just as the weary waiter returned with Retief's musty ale and the Groaci's sundae and wine.

"Hey!" Whish objected as the overflowing plate

was placed before him. "I wanted pickles, not bananas—Kosher dills," he added.

The waiter nodded glumly. "Maraschinos?" he inquired dubiously.

"Pickled onions," Whish corrected. "And just bring the chocolate sauce; I'll put it on myself."

The waiter shuffled away, still muttering querulously.

"What kind of ice cream is under the banana?" Retief asked. Whish replied that it was egg-and-olive. As if to prove it, he dug out a morsel of olive with the slender spoon provided and sniffed it dubiously, then subjected it to the scrutiny of his inconspicuous bloof-organ.

"Are you really going to eat that?" Retief asked.

Whish crossed two pairs of eyes, the dizzying Groaci equivalent of a wink. "Naw," he demurred. "Just another Booch item. Drives the old boy up the wall."

Retief watched as Whish transferred the sundae to a plastic container he produced from beneath his broken-ribbed hip-cloak.

"All right," Retief said when Whish had tucked the carton back out of sight. "That's enough Booch for now. Now we're going to talk business."

"Or?" Whish inquired archly.

"Or you're going to eat that mess," Retief informed him. "Start talking."

"Retief! You wouldn't," Whish gasped.

"Would I not?" Retief countered. "Tell me all about it."

"I am but an innocent go-between," Whish protested. "What do I know of great affairs?"

"Great affairs, eh?" Retief commented. "That big?"

"To read too much into a mere figure of speech," Whish protested. "To have merely overheard a comment in the conference room as I was emptying waste-paper baskets, as is my humble duty."

"Whish," Retief said reproachfully, "are you trying

to tell me you're not a major in the State Security Establishment?"

"What would a mere Terry know of Stasestab?" Whish dismissed the query. "Stasestab is a Cosmic Top Private Agency. And besides that, it doesn't exist!"

"Sure," Retief said agreeably. "But if it existed it would be for the purpose of 'promoting the interests of the Groacian Destiny on alien worlds, especially at the expense of inferior life-forms which presume to impede that Destiny', eh, Whish?"

"But that's a direct quotation from the CTP Stasestab Charter," Whish gasped. "Nonsense, that is," he corrected himself. "Never heard such yivshish in my life."

"How long do you think it would take to walk from here to the Outspace port?" Retief asked abruptly. "The Diplomatic Enclosure on the far side, I mean, where I noticed in the paper His Groacian Excellency's packet boat is docked at the moment."

"Far too long for one to contemplate the stroll as a morning constitutional," Whish replied shortly. "Why?" he added suddenly, aligning all five eyes in an expression of concentration.

"If the streets weren't so crowded, that is," Retief amended. "Perhaps six or eight hours, if we hurry, assuming we aren't stopped for questioning by the cops, who, I noticed, are out in force this morning."

Whish brought his boney wrist up and carefully studied the oversized Gene Autry watch strapped to it. He jumped to his feet.

"We must off at once, Retief!" he hissed. "Or I, at least, must off. You're of course free to remain and enjoy your refreshments."

"What's the hurry?" Retief inquired. "Eight hours too long?"

"Certainly not!" Whish snapped. "Things are all set for five pee em—so we've scads of time. No,

wait—if that scamp Thilth has misled me, that could be cutting it a bit close. So one may as well provide a certain margin for error, eh, Retief?" As he finished his speech breathlessly, Whish scuttled suddenly sideways out of the booth, colliding with the tapman just returning with Retief's ale, which slid from the tray to be caught in midair by Retief's deft grab.

"Settle down, Whish" he counseled. "Colonel Thilth wouldn't kid an old colleague like you, would he? Five, you said. Lots of time. Anyway, what's so interesting at the port?"

Before Whish could reply, there was a sudden flurry of activity from the direction of the door, and First Secretary of Embassy of Terra Magnan skidded to a halt beside the table, hurriedly smoothing his hair.

"Oh, there you are, Retief!" the slender diplomat blurted breathlessly. "His Excellency suggested I join you and caution you to do nothing precipitate! Got ropeburns in my descent, and had to give an officious flatfoot a tenner plus a piece of my mind! Then the mob turned on me. I fled barely in time. May I sit down?" He perched on the edge of Whish's bench seat and worked on his breathing, looking back over his shoulder anxiously.

" 'Catch that madman and see to it he doesn't set Slub-Terran relations back a decade, before teatime!' eh?" Retief reconstructed Magnan's instructions.

"Those weren't his *exact* words," Magnan panted. "But it's clear you grasp the intent of the Ambassadorial instructions."

"Whish here was just telling me everything's set to blow sky-high at five this afternoon," Retief told his senior officer. "He's in a hurry to get to the port before then."

"That," Whish stated indignantly, "is a misquotation, Ben." He pointed three eyes directly at Retief

in Outraged Accusation (13-d), keeping the other two on Magnan.

"His casual way with a quotation rates your *-t* at least, Whish," Magnan sniffed. "Now, shall we stroll back to Embassy Row, and have a nice chat just between ourselves?" He got to his feet and made Alphonse-and-Gaston ushering motions inviting the Groaci to follow suit.

"Oh, you think you're going to pump me, and maybe sneak inside the Embassy Compound for a look-see, do you, Ben? Tsk," Whish objected. "I gave you credit for more subtlety than that. Old Retief here squeezed a few hints out of me by illegal methods, but that's all you get! I'm clamming up now, so you can sweat out five pee em and see what happens."

"On behalf of His Excellency the Terran Ambassador Extraordinary and Minister Plenipotentiary," Magnan said hastily, "I apologize for Retief's methods, Whish, so don't be a spoilsport. What's this about five pee em? Why, that's after office hours—and on a Friday, too!"

"Oh, nothing much," Whish dismissed the subject. "Just a bit of sport in the spirit of Booch." He paused to entwine two eye-stalks in expression of Suppressed Hilarity (17-g).

"But," Magnan protested, "I must insist that sending His Terran Excellency a jack-in-the-box disguised as a bomb is hardly a jape calculated to merit the approval of the *Corps Diplomatique*! You owe me some explanation of all this, I insist!"

"Of all *what*?" Whish demanded. "I served my function as a humble messenger in extending his Groacian Ex's esteem to his Terran colleague—and Retief here chased me down and is attempting to force me to ingest pickles with chocolate sauce! Not only that, he doubted my plighted word! Aloud!"

Magnan gave Retief a shocked look. "Retief! You

didn't! I mean, the protocols covering inhumane tactics. . . ."

" 'Inhumane'?" Whish echoed. "They're positively sub-Groaci! Now, I shall do the demanding: let Retief offer a suitable apology at once!"

"The esteemed gentlebeing says that I called him a liar," Retief said solemnly. "It's true, and I regret that."

Megnan plucked at Retief's sleeve, an anxious expression on his narrow face. "Perhaps a more elegant expression would be in order," he whispered. "Besides, what you said could be misinterpreted."

"I tell you, gentlemen," Whish cut in as sternly as his weak voice could manage, "His Excellency did not dispatch a jack-in-the-box disguised as a bomb. I defy anyone to give the lie to that."

"Why, what cheek!" Magnan gasped. "I was there myself, I saw it jump out and nearly frighten poor Ted back to the rank of corporal!"

Retief got to his feet abruptly. "I think this time he's being technically correct, Mr. Magnan," he said. "If it isn't a jack-in-the-box disguised as a bomb, then it must be a bomb disguised as a jack-in-the-box." He went across the dim-lit room to the public talker in a booth in the rear corner, quickly punched keys.

"Code Room. Jerry," a voice responded lazily.

"Jerry," Retief said. "Go to the Chancery at once, enter the Ambassador's office without waiting for an invitation, go to the desk, pick up the package there, and rush it to the sub-basement. Dunk it into a fire bucket, and then put it in the emergency vault and get out quick and close the door. Got it?"

"I got it, Mr. Retief," Jerry said dubiously. "But what *is* it? If I barge in on old Hairshirt, he'll have me boiled in oil, and maybe even fire me! What's it all about?"

"I'll tell you later, Jerry," Retief answered the young fellow. "Right now, do it—and fast!"

"OK, if you say so. But I know you'll back me up—not like most of the Embassy big shots. OK, Mr. Retief, I'll do it."

Back at the table, Retief soothed Magnan, then turned to Whish, whom Magnan had restrained by putting a foot on the elusive Groaci's knee under the table and exerting a pressure just short of that required to burst the fragile joint a circumstance which the trapped alien related to Retief in an aggrieved tone.

"Nice work, Mr. Magnan," Retief congratulated his supervisor at the conclusion of the indictment. "Let up now, and I'll just sit here beside him." He slid over on the seat to pin Whish against the wall, where he struggled for a moment, then relaxed, all five eyes adroop, miming Acceptance of Unjust Fate By Virtue of Superior Strength of Character (27-c).

"Better make that a z-plus, Whish," Retief suggested. "You know, the 'Gee, Fellows, this time I Really Mean it' degree."

Whish adjusted his oculars accordingly. "I hope you're sport enough not to let Ambassador Shish find out I used my z," he offered submissively.

"Not unless you forget to mention just what it is your errand was intended to distract our attention from," Retief reassured the cowed Groaci.

"Oh, fie, back to that silly idea," Whish commented dismissingly.

Retief nodded. "That *was* egg-and-olive ice cream, wasn't it?" He queried, turning to catch the waiter's eye. Whish made a lunge for freedom under the table, fetching up in Magnan's lap.

"Ben!" the Groaci hissed. "You wouldn't let him! In all our past dealings—not ours personally, of course, since we've met only at receptions and cocktail parties, but in Groaci-Terran relations generally, I mean—the record has never been sullied by any such atrocity! I appeal to you as a representative of civilized *mores*

to stop this madman before he carries out his fell intent!"

"Ah, to be sure, Whish," Magnan temporized, extricating himself from the Groaci's frantic embrace. "Do be calm. Just what fell intent is that to which you refer?"

"Ben," Whish shrilled, "this is no time for punctillious syntax! Call him off!" He broke off to tilt his triangular head alertly, all five oculars ranged across the top quivering erect.

"Mark!" he breathed. "The time for servile appeals to your good nature has passed, Ben!" he went on, more emphatically. "In moments the true status of Terry meddlers vis-a-vis Groacian Manifest Destiny will stand revealed!"

With a crash, the front door burst inward, and a full squad of Groaci Peace Keepers in flared helmets, gold-sequined greaves, dowdy greenish-black hip-cloaks and plain GI eye shields had crowded in, scatter-guns leveled at the occupied booth.

"To consort with dubious companions, Major Whish!" the non-commissioned officer in charge hissed. "To suggest you come out at once, my field of fire to clear!"

"The major wouldn't find that convenient," Retief told the sergeant. "He's just working out the details of how he can survive the lunch hour."

"To hold your tongue, impertinent Soft One," the NCO replied, adjusting the aim of his weapon to bear between Retief's eyes. Retief studied with interest the gun muzzle six inches from his face.

"A Groaci copy of a Japanese version of the Webley .59," he noted aloud. "By the way, Sarge, did you know your safety was on, in the locked position?" As the Groaci looked down, Retief rose, pushed the barrel of the crater gun aside, then jerked it toward him, snapping it from the grip of the squad leader with such vigor that the Groaci's helmet fell off with a

noisy clatter. Retief took a grip on the non-com's neck and, reversing the weapon, instantly fired a round between two troopers to smash the front window.

"Tsk," he commented. "I must have been mistaken about that safety. Now, you boys may drop your guns and line up against the wall, right over there." He gestured toward the rustic brick partition beside the fireplace. Weapons clattered to the floor as the Groaci complied.

"Retief! No!" Whish keened. "To line up these brave lads and shoot them down in cold vascular fluid would be an enormity on a par with the infamous massacre of this Saintly Valentine! Stay your hand, I beseech you! I—I'll tell you all you desire to know of our Booch Day surprise!"

Retief fired a second round, this one into the brick-work, to assist a laggard Groaci in assuming a symmetrical position in line.

"Really, Retief," Magnan quavered. "While, I acknowledge, it would be deeply satisfying, as well as amply justified, to slaughter these criminally misled fellows out of hand, it really wouldn't look at all well in my weekly Chumship Report. So perhaps you could limit your target practice to merely shattering their kneecaps, say, so a few would survive at least, to get their livelihood in the alleys of the city—those, I mean, who survive the fury of the Slubbese when they learn the part these cripples hoped to play in the destruction of the planet."

"Oh-oh," Whish muttered. "So somebody *did* blab. I mean, 'destroy the planet'? How absurd!"

"I didn't mean that literally," Magnan sniffed. "Even you Groaci would hardly sink so low as to wipe out an entire planet and its indigenous mentational species merely for petty political advantage."

"What's so petty about political advantage?" Whish demanded. "And who say these Slubs are a mentational

species? My pet moopah has got more savvy than these dullards!"

"Still, one can't exterminate them out of hand," Magnan pointed out.

"But it's OK to exterminate the second squad, third platoon, Company B, eh?" Whish challenged.

"I'll think it over," Retief conceded, putting a third shot half an inch from the hand of a larger-than-average corporal, which member had been inconspicuously creeping toward the reserve 2mm under his hip-cloak. The corporal jumped and slung his hand. "Them brick chips smarted some!" he wailed. "I'm putting this in my report, wise guy!"

"Silence, nest-fouling twin of a genetic deficiency!" the captive sergeant hissed at his subordinate. "To take note of the fact that both your advancement in the Service and my own would be severely inhibited by a .99 in the cranium! Goad not the Soft One, lest he vent his long-suppressed resentment of Groacian superiority in the form so vividly outlined but a moment agone!"

"Well, Sarge," the number two replied cheekily. "Saying about Groaci superiority and all ain't likely to sooth him none. Ten-HUT! you slobs," he added, casting a glance along the ragged rank beside him.

"Very well," Whish moaned. "Here it is, Retief—and I'm only telling him to save you boys from a dire fate, to no benefit to proud Groac," he added, addressing the sergeant, still struggling feebly in Retief's grip. "Better relax, Snish," he ordered. "A Terry's grip is stronger than a Groaci's neck any day, so take it easy. I'll get you out of this." He turned to Retief. "Later," he said, "I'm sure you'll be grateful that I prevailed upon you to stay your hand."

"Not really," Retief replied. "I had no intention of shooting anyone."

"But you said—you threatened . . ." Whish broke off, looking resentful, an expression he managed by

squeezing his two outer pairs of eyes closely together, allowing the center one to droop.

"No, that was your idea entirely," Retief pointed out.

"Ask Ben," Whish proposed, turning to face the senior bureaucrat. "He said he'd shoot us all, didn't he, Ben?" the Groaci entreated. "You were a witness to the entire atrocity! Surely you won't deny it!"

"Actually," Magnan said thoughtfully, "all Retief said was, 'Drop your guns and line up,' then you started babbling about Interplanetary Law."

"Not once did I invoke the absurd fiction known as Interplanetary Law, Ben," Whish said reproachfully. "And it was you, yourself, who proposed to maim these splendid troops and send them out into hostile streets to beg."

"The options are still open, Major," Magnan said crisply. "You'd better start spilling the legumes, before you rouse my ire."

"I don't think we've quite convinced the major we mean business," Retief told Magnan. "If you'll stay here and keep an eye on them, I'm going over to the waterfront and check on a few items."

"Retief! I must demand. . . ." Whish started and lunged for freedom, rebounded from Retief's immobile fist and sank, whimpering, into his corner.

"Better keep a firm grip on him, Mr. Magnan," Retief suggested. He curtly ordered the sergeant and his squad to go outside and disperse; then he turned and left the saloon.

In the bustling street, an unusual number of uniformed Groaci were to be seen, officiously directing traffic, haranguing shopkeepers, and hustling outraged citizens toward paddy-wagons. Retief made his way through the crowd, to be abruptly confronted by a Groaci Peace Keeper wearing the elaborate shoulderboards of a full colonel, a distinction rendered somewhat ludicrous in appearance by his lack of shoulders.

"Here, fellow!" the cop hissed. "Terry, aren't you, Big fellow? You wouldn't by any chance be the notorious wrecker and enemy of the Groacian state known as Retief, I suppose?"

"The odds are against it," Retief pointed out. "At last census there were just over a hundred billion Terries registered, not counting hybrids, on five hundred and sixty-one worlds, so the chances that any specific one would be standing right here contemplating throwing you into the refuse bin at this moment are small indeed."

"To be logical," the colonel acknowledged. "But you being a Terry and all, you better watch it; I got my best three eyes on you, and my snarf-organ, too." He turned away.

"But as it happens," Retief continued, "this time the laws of probability seem to be in abeyance." He took a firm grip on the Groaci's thin neck and dragged the feebly struggling officer to the large, bilious-yellow hopper marked in angular Slubbese linear X, 'official use only—property of Slub City'. He thrust the colonel in, head first, and continued on his way. The passers-by ignored the incident with the exception of one fellow in dock-wallopers' traditional attire, with a visage coarse-featured even for a Slubbese, who stopped to watch, then applauded raucously, muttered "Nice going, Terry!" and fell in behind Retief.

"Say, pal," the stevedore said companionably to Retief's back. "I kind of like your style. I heard about how you Terries are nefarious or something, and all, always picking on the noble Groaci and all, but frankly, I ain't nuts about the noble Groaci myownself. Where you headed, big fella? By the way, the handle's Vug."

Retief paused and waited for the local to overtake him, then said, "It's a pleasure, Vug. I'm Retief." He shook manipulatory members with his new acquaint-

ance and inquired, "Where'd you learn to speak Terran?"

"I got me one of them brain-tapes like you see in the ads," Vug replied. "That reminds me, the other day I seen in my comic book where a fellow can pick up a snappy necktie that glows in the dark and like that. Only three plunt, too, including shipping and handling. I don't know what that handling is, but I guess it'll be a useful item when it comes. Onny trouble is, I don't have no idear how to get what they call a interplanetary credit voucher like it says in the ad I gotta send. Maybe you could tip me off, hey, you being a foreigner and all."

"I'll make a note of it," Retief suggested.

"Geeze, I figgered you was a right guy as soon as I seen the way you taken time to tuck that copper's feet inside and all before you slammed the lid," Vug commented admiringly. "But I ast you, where we going? And what's the rush? This is Booch, remember, and I got the day off. Figgered I might mosey over to one of the joints in skunk-town, where a fellow can get into a few fights, and get a nice plate o' food, and some whiz-water, and some nice dames, too. Whatta ya say? But I guess you'd prefer one o' them strange-looking Terry broads, no offense."

"Not today, Vug," Retief declined gracefully. "I've got a small job of planet-saving to do, at the harbor."

"I better go along," Vug suggested. "I know my way around out there, which there's some pretty tough characters hang out along the waterfront. And we can grab a bite at the Collapsed Lung, a what they call quaint old dump, but the eats is good. You can get a plank steak hand-cut from the choicest planks, like the menu says."

"Sure, glad to have some company," Retief agreed. "By the way, what do you know about a drill-rig called *Challenger*?"

"Old trawler conversion," Vug told Retief. "These

here Groaci fitted her up with a derrick yeah high. Been out exploring the Voon Deep, I hear. That's the deepest part of the Big Trench, about halfway to North. Don't know what they expect to find out there. Oil formations is all up on the shelf; they ain't looking for tendril-tonic, that's for sure. But I hear rumors," he added, "there's Something Up—onny they're drilling down. That's a little joke, Retief. You got to excuse me: I got this here sense of humor and all."

"It must be a sensitive faculty indeed," Retief observed.

"You bet," Vug confirmed. "Some guys wouldn't have saw the potential for a good jape in that there, about 'up' and 'down', and all."

"Perhaps the CDT could find a position for you, Vug, if you're interested," Retief said, "advising Ambassadors when to laugh."

"Naw, I got no innerest in a fancy desk job," Vug declined. "Thanks anyways for the thought. But what's a post like that pay a feller?"

"Not much—only about fifteen hundred guck," Retief replied.

"A thou-five a year?" Vug echoed. "Not bad. Maybe I better give it some thought after all."

"Per week," Retief corrected. "Plus commissary privileges and a fat retirement plan."

"You're talking me inta it." Vug warned. "Plenty o' travel, too, I guess. And a crack at some o' that Terry whiz-water, which I hear it's got plenty vitamins."

"All that, and close association with His Excellency, too," Retief confirmed.

"Well, ya gotta take the bitter with the sweet," Vug philosophized. "Do I get to wear one of them fancy suits with the chrome-plated lapels, and a stripe on the pants and all?"

"It's obligatory," Retief said.

"Too bad I don't wear no pants," Vug pointed out. "Would it be OK if I just had the stripes?"

A few minutes later, comfortably ensconced in a corner booth in the Collapsed Lung, Retief scanned a pamphlet relating the circumstances surrounding the long-ago establishment of the house and the genesis of its name. The tranquility of the crowded premises was somewhat diminished by the four—no, make that five, Retief corrected—fist fights in progress, spurred on by the merry cries of the clientele, themselves bearing the marks of recent combat, and the monotonous chant of the proprietor, distinguishable from the other combatants by his vigorously-wielded bung-starter and his steady cry of 'Break it up, you bums.'

"See?" Vug said contentedly, over the din, supplemented by a jukebox exhorting all present to *Do the Hucklebuck*, one of Franky's lesser efforts. "I tole you it was a nice cheerful place, Vug asserted. "Now, Retief, if some of the boys try to come over and give you a hard time, you gotta excuse 'em, which they're onny tryna make ya feel welcome."

At that moment, a local citizen nearly as big as Vug lurched to a halt beside the table, his shadow falling across it.

"Hey, Vug, what's this you drug in here to the Lung?" he demanded, eyeing Retief distastefully. "Some kinda foreign bookworm, hey?" The stranger poked a blunt, sausage-like finger, lacking its first joint, at Retief's pamphlet.

"We don't cotton to no dudes around these here parts, stranger," he announced.

"That's good," Retief commented. "I can't stand 'em myself, and by the way, I'm not a stranger back in my home town."

"Yore home town is a dirty, low-down dump,"

Retief's new acquaintance announced. "Prolly full o' rats and frubs and cockroaches and cops."

"Right on almost all counts," Retief agreed. "We don't have many cops. Killed 'em all off."

"Don't come in here bragging about yer lousy home town, which it's prolly some kind o' slum," the Slubbese warned; then he drove a straight right jab at Retief's jaw. Retief moved his head slightly to avoid the blow and with one hand pinned his attacker's arm to the table, thus bringing the fellow's face to within an inch of the scarred tabletop, his head twisted to stare up at Retief.

"You gotta excuse Gub, which he had a few," Vug commented. "He don't mean no harm."

"I was onny kidding around, pal," Gub explained, his voice a trifle strained by his awkward position and the overextension of the elbow joint. "I ain't gonna hurt you bad, feller."

"You sure aren't," Retief agreed. "On the other hand, you were standing in my light, and on top of that, nobody has a right to be as ugly as you are." He stood in a leisurely way, hauled Gub in, lifted him above his head, and threw him into the thick of the action.

"You ain't sore, Retief?" Vug inquired anxiously. "Old Gub ain't a bad guy, just got no judgement, is all, like the time he stuck his finger in the oil hole on the boat-hoist, just cause it was there, you know, like that mountain someplace. He yelled some when them gears chewed his fingernail fer him. He's what you call a slow learner."

"We have a few of those in the Corps," Retief commented. "They persist in offering an arm to a shark on the theory that will make him go away satisfied."

"Heck," Vug commented. "Any dummy oughta know that just gets them going, when they taste blood."

"A discovery," Retief said, "which so far has eluded our Underground Deep-Think Teams."

Retief and Vug lunched on snick-berry-and-sardine salad and a tasty local beer. Then, without further incident, departed the Lung and took a broken-down ex-Dallas, Texas cab to the waterfront. They alighted on a blighted corner in front of a former ship chandler's warehouse. At once, a pair of down-at-heels locals emerged and sauntered over. The first, a paunchy fellow wearing a tarnished green vest, halted before Retief and looked him up and down.

"You're lost, chum," he stated indifferently. "No easy pickings for capitalist imperialist blood-suckers around here," he amplified, planting himself squarely in Retief's path.

"Too bad," Retief commiserated. "Maybe you can find some over by the *Challenger.*"

"Hah?" the paunchy Slubbese mimed confusion, an inept attempt at a 202—about a 'c' the fellow was trying for, Retief decided (Rightful Astonishment at Unwarranted Misinterpretation of Pure Motives). "It ain't *me's* looking to break the rice bowls o' the downtrod masses!" he protested. "But it might be an idear at that," he added confusedly.

"May I trouble you to step aside, sir?" Retief inquired mildly.

"Nix, Retief," Vug cautioned. "These kind of bums always interpret courtesy as weakness. Thinks you're scared of him." With that Vug jostled the fellow aside and started across the slimy cobbled street, pausing as a taxi even shabbier than the one in which he and Retief had arrived shuddered to a stop at the curb just by the wharf where *Challenger* was tied up.

Retief caught a glimpse of the passenger inside the elderly vehicle, crossed over in time to see a short, knobly-kneed individual wrapped in an unseasonable cloak emerge, hand over a coin which elicited a yelp

of protest from the driver, and go briskly to the gate barring access to the dock. The driver looked up in astonished delight as Retief came up and handed him another coin.

"Geeze, Terry—you *are* one o' them Terries, no offense. . . ." the startled chauffer began confusedly.

"It's an honor," Retief reassured the blunt-featured Slubbese. "Now, did Major Whish stop off anywhere on the way here?" he added smoothly.

"The other Terry," the cabbie remarked reminiscently, "boy, was he excited! Chased me a block and a half, and if my junction-box wouldn't of settled down, he'd of caught me. Kept yelling stuff about saving the world. Some kind o' religious nut, I guess."

"Mr. Magnan will be flattered at your assessment," Retief told the fellow. "But did Whish come directly here from the Pink Moon, or. . . ."

"Had me stop at a hair-goods boutique on Gutter Boulevard," the driver replied. "Had the old meter ticking for eleven minutes and some. Then the bum hands me a five-sprug piece—don't hardly cover the fare, let alone the tip. But o' course your tenner fixed that OK. What are you, his keeper, or what?"

"Almost," Retief acknowledged. "Technically, I'm Assistant Cultural Attaché for Disgraceful Affairs."

"Oh, sounds like a important post," the driver commented, just as Vug came up and tugged at Retief's sleeve.

"I guess you din't notice, Retief," he muttered in a conspiratorial tone. "But the bum got outta the hack is one o' them Groaci—I can tell 'em from you Terries by the skinny legs. Anyways, he acks kind of sneaky, over there looking the drilling rig over, got something in mind, I bet. And you was saying about the tub. So I figgered maybe. . . ."

"Precisely," Retief confirmed Vug's thinking. "Come on." He led the way across to where Whish was busy with a large ring of keys, working on the oversized

padlock securing the gate. The Groaci whipped four of his five stalked eyes around in an astonished expression as the Big Terran came up beside him.

"To wonder at your presence here, during office hours," he exclaimed breathlessly. "But now I recall," he added. "Your flimsily built Embassy collapsed earlier today. Pity and all that."

"Not quite," Retief corrected. "It seems the bomb was a real one, all right, but it was accidentally stored in an old vault in the basement, so if and when it went off, no harm was done."

"But that's. . . !" Whish started, then broke off. "That's too bad," he amended awkwardly. "No wonder Pud and his chaps are a trifle late." He consulted his strap-watch and sighed. "One's entire reserve stock, destroyed by accident," he muttered. "To offer me commiserations, Retief." Just then the lock fell open and he ducked through the gate, instantly slamming it behind him, and resecuring the lock.

"To excuse me," he whispered, "but of course, as a fellow diplomat, you understand my zeal in maintaining the security of Groacian state property. Not that you'd dream of violating a high security area, prominently posted," he added through the wire mesh, before darting away along the pier.

"Tough boog-nodes, we can't follow him," Vug commented. "Looks like the little rascal made points that time. I betcha he's up to no good, too."

"I have the honor to decline that wager," Retief replied, at the same time examining the big padlock, a Groaci copy of a Japanese version of an early Yale model, he noted. Grasping it firmly, he twisted it to the left until the sheet-metal hasp began to bend, then yanked it hard, eliciting a sharp *ping*! as it came free. He tossed it into the oil-scummed water lapping at the ancient timbers of the wharf, opened the gate and Magnan passed through, while Vug watched, his small, deep-set eyes registering shock.

"Nix, Retief," he said hoarsely. "This here is a top-security area. We got no right—even if it *did* have a broke lock on it. Come on, let's do a fast fade before the little devil puts out a squeal and we get about six carloads of law down here to put the sneeze on us."

"You run along, Vug," Retief suggested. "I have business to transact with Major Whish." He turned and went along the narrow pier, lined with plank-hulled boats in various stages of terminal decay, their bilges awash in murky fluid dotted with floating fish heads.

There was the sharp *bzzzpp*! of a Groaci power gun and splinters flew from the weathered planks beside him, leaving a deep gouge from which arose a resinous odor. Not deviating from his course, Retief advanced steadily toward the bales stacked in the shadow of the drill-rig, from behind which the shot had come. As he reached the first bundle (of half-cured, ice-worm hides, he noted) there was a sudden faint scraping sound from behind the smelly skins. Retief came around the bundle in time to grab the thin arm of Whish just as the latter snapped a new power cell into his handgun. Retief plucked the weapon from the major's grasp and dropped it into his pocket.

"Tsk," he chided his captive. "Naughty. That shot you fired was a considerable overreaction, for an innocent diplomat just out to look over the state of selfless Groac's gift to the Slubbese people. What are you really here for, Whish?"

"As you well know, vile Terry meddler," Whish keened. "Our oceanographic studies can redound to the immeasurable benefit of the backward autocthones of this benighted world. I shouldn't like to be in the shoes of the luckless foreigner who sought to interfere therewith. Now, unhand me, and maybe I'll let you off with a formal apology."

"Not likely, Major," Retief demurred. "Let's go take a look belowdecks. You were in too big a hurry to get here."

"Baseless base canards!" Whish hissed, then switched to Groaci. "To defy you to violate sacred Groacian premises, especially the very precincts which embody and symbolize Groac's gift to Slub. Crowds of outraged locals will rend you limb from limb."

"I guess I'll have to take that chance," Retief told the excited fellow. "Lead on, Major." Vug trailed them at a distance.

"To have reminded you that I am but a humble Admin type," Whish reproved. "To wonder why you persist in your delusion that I am a field-grade Intelligence officer."

"I'm impressed by your modesty, Major," Retief said. "It must be a fairly big operation you're covering up, to inspire a rank-conscious Groaci field-grader to come on like a GS-3 clerk."

"Pah!" Whish spat. "To find it useless to reason with a miscreant of your stripe!"

"Sure," Retief agreed. "So let's get on with it."

He waved the Groaci ahead up the swaying gangplank. Pausing only to salute the quarterdeck, Whish scuttled across and darted toward the tumble-down deckhouse, halted abruptly and patted the baggy pockets stitched to his doublet in the manner of one searching for his wallet, and turned to announce to Retief, close behind him, "Ah, Fate intervenes! You are saved from further violation of Groacian sovereignty, scientific objectivity, and my own inviolate person by the curious circumstance that I appear to have forgotten my keys!"

"To this?" Retief asked, indicating the five-foot high, dark-green painted door set in the clapboard wall beside them. Without awaiting a reply, he snap-kicked the panel at latch level and it burst inward with only a mild splintering of the door jamb.

"After you, Major," he offered graciously, and thrust his host ahead of him into the cluttered cabin, Whish turned quickly to a chart table and began rummaging among the papers scattered thickly there. Retief came up silently and grabbed the Groaci's arm.

"I noticed you were in a hurry to cover up something over here," Retief explained. "So let's see what it is." Whish plunged and fluttered, screeching thinly.

"To pry no more into matters beyond the comprehension of a non-scientist!" he shrilled. "To stay your hand, Retief! Some matters were better left unbroached!"

"Perhaps he's right," Magnan's voice came from the open door. "It *is* a bit much, Retief, to invade the premises of the well-publicized Groaci Goodies for Undesirables project and Groaci-handle the Project Director. The media, I fear, will see this in a light perhaps even dimmer than that which will illume Ambassador Hairshirt's view of the matter."

Retief nodded as if agreeing, and invited his supervisor to enter, at the same time brushing aside the papers Whish had, apparently casually, spread across the chart displayed on the illuminated board.

"I was able to trace Whish's cab, luckily," Magnan explained. "I'm glad to see you've laid him by the heels. But shouldn't we be doing something about this Project Cancel, rather than sightseeing?"

"All in good time, Mr. Magnan," Retief soothed his senior.

"I was almost set upon when I alighted from my conveyance," Magnan told Retief aggrievedly. "The vehicle was something called a Reo, a '32', the driver told me, whatever that is. But as I was saying, I stopped off in front of a most noisome dive with a sign bearing a crude painting of a pinkish cheese, it seemed, and the legend 'Ye Busted Lunge'. Anyway, these three, truly evil-looking locals rushed out, but I fixed them with a stern glance and they tugged at their forelocks and withdrew!"

"They seen he was a Terran, Retief," Vug's hoarse voice came from the entry. "And they wasn't messing with no more Terries today. Funny thing, Retief," he said. "Under them rotten deck-planks, there's new steelwork. This here tub is more than meets the snoof-organ, like they say."

"I was about to say it was a frightfully shabby vessel for a project of such celebrity," Magnan said, brushing aside scarlet cobwebs. He came over to peer over Retief's shoulder. "Gracious me!" he exclaimed. "If it weren't so fantastic, I'd think that was a compilation of stress-profiles from the Voon Deep area." He edged around Retief. "And this red X," he put a well-chewed forefinger on the symbol boldly inked on the chart. "The standard indication for EXTREME DANGER! What, may I ask, Whish, does it indicate in this context?"

"Mere caution on the part of the Chief Engineer," Whish dismissed the query. "One should dislike to have some simple fishing vessel venture into the work area, of course."

"Still," Magnan demurred, "according to the code of the Interworld Commission for Navigation, the designation is to be employed only for minefields, active volcanoes, and the like. It appears rather excessive."

"You think so, Ben?" Whish riposted smoothly. "Let us wait and see."

"I don't like it, Retief," Magnan confided behind his hand. "I think perhaps the scamp is still being devious."

"That's what the major was about to tell me," Retief told the older man. He turned to Whish. "Let's go below and look at the drill rig," he suggested. When Whish redoubled his expostulations, Retief added, "Unless you'd prefer that we remain here, and dig a bit deeper into the documentation."

"That was a little joke!" Vug cried delightedly. "I can tell."

"If I must conduct a sightseeing tour, then I suppose I must," the Groaci snapped, and dashed for the door. Magnan stepped back quickly, and Whish tripped over his foot. Retief grabbed the screeching major by the ankle and hoisted him up, then shifted his hold to the Intelligence officer's neck and righted him. "I've changed my mind," he said. "You're too eager to go, by half."

"Look here, Retief," Magnan said excitedly from a desk by the bulkhead. "Specifications for 'Class P High Explosives (special underwater formulae)'. What do you suppose . . ."

"In our researches," Whish keened, "it is sometimes necessary to clear overburden from points of interest, remove volcanic debris, et cetera—matters unqualified personnel cannot be expected to grasp. I renew my demand that you cease this lawless meddling and let go my neck, Retief!"

Retief complied, and Whish impacted the deck with a force that dislodged his medium-ornate eyeshields, for which he went scrambling under the chart table. Magnan stooped and retrieved him, clutching an overflowing wastebasket.

"What have we here?" Magnan inquired as he removed the receptacle from his captive's clutch.

"Mere rubbish, Ben," Whish dismissed the query off-handedly. "Trash I'd been meaning to burn—nothing more."

"I see," Magnan replied. "Still, I think we'd best have a look." He offered the container to Retief, who plucked from it a crumpled sheet which he opened flat, finding it to be covered with calculations in crabbed Groaci numerals.

"Your computers are out for repair?" Magnan asked Whish, now limp in his grasp.

"By no means," Whish snapped. "Actually, Ben,"

he added in a tone of candor, "I've been playing in the local pools."

"I haven't heard of one called 'Cancel'," Retief commented, "which seems to be the entry in the 'subject' column here."

"Botheration!" Whish hissed. "Burn the rubbish and let's forget the matter. If you care nothing for Interplanetary protocols, you might at least consider my career! Now, let us proceed to other matters: you were about to examine the cargo hold, as I recall, quite illegally, of course."

"No, it was the technical area I had in mind," Retief corrected.

"Speak up, Major," Magnan commanded sternly. "Before I forget I'm a gentlebeing."

"Don't rib me, Ben," Whish dismissed the demand. "I know you already Know All. I heard you threaten to tell the locals about the scheme to destroy, as you put it, the planet, even though that's an exaggeration. Clearly, some wretch has already blabbed!" He wagged his head dispiritedly. "An undetected security risk, probably in my own department," he mourned. "Operation Cancel was our best-kept state secret. I dread to contemplate His Excellency's wrath when he finds out there's been a leak."

"I shall want full details of Cancel for my report, of course," Magnan sharply reminded the crestfallen Groaci.

"I suppose it hardly matters, now," Whish conceded. "Since you're aware that in less than four hours the minor world once known to its inferior inhabitants as Slub will be racked by tectonic activity which will release valuable unoccupied former seabottoms for Groaci colonization, you may as well know that the hell-bomb was placed less than a week ago by myself, as an unbilled embellishment to the spurious oil exploration expedition you were so

kind as to sponsor, Ben. We smuggled in the components as office supplies meriting duty-free entry, of course, as is customary. The rest is mere yivshish."

"Major Whish!" Magnan cried, pale with shock, or with something which made him pale. "You didn't! You couldn't! A Class X-One explosive device placed among the black smokers in the Voon Deep, where *Challenger* carried out her reconnaissance, would initiate a new age of mountain building! West Continent would slide over against North and subduct, carrying with it into the magma all the major ports on the planet—and the rich farmlands of the entire coastal plain would be inundated! The very concept is too hellish to contemplate!"

"See, I said you know all about it, Ben," Whish snapped in a tone of Righteous Vindication (13-b). "So why don't we think about something pleasanter, eh?" He went on in a reasonable tone. "Like the fashion in which selfless Groacian emergency teams now luckily standing by off-planet, will rush in to restore order, salvage national treasures, and dole out hot soup to any unfortunate survivors; after which, quite naturally, Groac will stake legitimate claims to newly exposed and thus uninhabitated coastal areas, now made available for productive colonization. And think of the dramatic scenes during the rearrangement phase: great new mountain ranges thrusting skyward along the present Old Fault on North; the boiling of the sea as volcanoes of released magma come welling up from the depths; the limitless vista of the vast expanses of newly exposed globigerinous oooze drying in the sun, after ages of accumulation in the depths, as the sea drains away from the uplifted continental shelves! The yokels of the entire Arm will flock to view it all! The tapes alone will pay for the entire operation!"

"But, Whish," Magnan protested gamely. "Can't

you foresee the reaction of the Galactic community to this enormity?"

"I foresee only sensational grosses," Whish replied complacently. "Plus *lebensraum* where Groacian ladies can rear their lovable grubs in peace, untroubled by the mutterings of displaced inferiors, or envious diplomats."

"The *Challenger* is sea-ready, I believe," Retief said. "With the drill strings still in place. Let's go for a ride," Retief suggested. "At worst, we'll get a ringside view of the catastrophe."

"Art mad, vile Terry?" Whish screeched. "Immolate yourself, if you desire a spectacular demise, but as for myself and my boys, we'll to the spaceport instanter, the Ambassador's transport to share, the better to view the spectacle from deep space."

Magnan rose. "Actually, Retief," he said, "the little wretch has a well-taken point. I believe that I myself would prefer to observe the phenomenon from orbit. Accordingly, I must waste no time getting back to the Embassy to warn His Ex; there'll be time to evacuate in good order, voucher files and all, if I start now. I'll see you after the show."

"It might be a good idea to wait, just in case the star act fails to materialize," Retief suggested. "No point in unduly upsetting His Excellency."

"Poor Clarence," Whish sighed. "The poor old thing means so well—but he's simply not equipped to face up to reality."

"Face up to Groaci double-dealing, you mean, Whish," Magnan corrected.

" 'Double-dealing', my dear Ben," Whish explained, "is an epithet applied by losers to superior strategy. And in that connection, I suggest you take note that the infamous Retief entices you to share his fate!" Whish keened as soon as Retief had left the cabin. "I have Told All, as I agreed, so it is now your clear duty to guarantee my safe passage to my Embassy!"

"Not so fast, Whish," Magnan temporized. "Clearly, you have a point; but in view of Section 3, paragraphs A-1 and 2 of the Yalcan Protocols, one might argue that your position remains equivocal."

"The Protocols you cite were never ratified by proud Groac, Ben!" Whish shrilled triumphantly, "and thus are not binding on me."

"Your cynicism does you scant credit, Major," Magnan reproved the now cocky alien.

"You can skip all that, Ben," Whish replied indifferently. "Your lawless meddling avails you naught. I have presented you with a *fait accompli*, so you may as well accept it in a reasonable fashion, demonstrating at a minimum the qualities of good losership, and hurry to abandon the continent before H hour."

"Perhaps I'd best accompany Retief, after all," Magnan decided and hurried off, leaving Whish in Vug's care.

In the dim-lit and cavernous hold, where Retief noted new light-alloy trusswork and the smooth humming of modern mechanical equipment, contrasting sharply with the rust and caked dirt of the setting, a number of small cubicles had been partitioned off along the bulkhead. He went to the nearest, pushed firmly on the top of the locked door until it bent inward sufficiently to spring the latch, and stepped inside. He flipped the wall-switch and a battery of high-intensity glare-panels showed him the bulky forms of climatic units, Class Nine navigation computers, and a state of the art proton-flow power unit. Among these standard items (for a ship of the line, Retief reflected), he noted the less familiar shapes of a 'cosmic disaster'-sized impact absorption sink, a pair of half-sun beamers, various specialized imagers and holographic amplifiers, a bool-type generator of cryptic function, plus a number of other heavy items unfamiliar to him. At that moment, there was a dis-

tant *whump*! and Retief stepped through the open door and saw an ascending dust cloud above the town's rooftops.

"Good lord, Retief!" Magnan gasped as he came up. He glanced inside. "This looks more like a command center than a humble trawler, or even a deep-sea survey vessel. What was that noise?"

"More like launch control," Retief corrected. "Notice the polyphase inductor panel, and the hologram gear. The noise was Whish's reserve supplies he had stashed in our number two vault going up."

"To be sure," Magnan agreed judiciously as he stepped back inside the hold. "Retief, you were right! There *was* a bomb under the jack-in-the-box: there is more to the Groaci scheme than the rather elementary though large-scale disaster Whish so graphically outlined—a bit too eagerly, as you pointed out. Which leaves us," he went on, "with the question: how can he top mountain-building and subduction, and still hope to leave something for Groac to salvage?"

"Does it not?" Whish's reedy voice came from behind them.

"Sorry, Retief, and Mr. Magnan, too," Vug spoke up from outside. "But the little runt faked me outta position—said he just remembered about a bomb and all. Just then something blew over Embassy Row. I hope it wasn't nothing important. Sorry about that; nothin' I could do."

"It's all right, Vug," Retief soothed the agitated dock-walloper. "It was merely a small distraction from the main business."

"You mean about what these here Groaci sapsuckers were up to out to Voon Deep?"

"Not quite," Retief corrected. "That was red herring number two. I have a hunch I need to check into a little more closely. Mr. Magnan, will you take the recording rod from the big pressure monitor over there?"

After receiving more explicit directions, Magnan complied. "Goodness, Retief," he gobbled, as he studied the bar-shaped magnetic stack he had extracted from the complex apparatus. "This is a thousand-day rod, and it's nearly full! That would be enough to chart the tidal pattern for the entire planet through at least a full biennial cycle."

Retief accepted the proffered recording and nodded toward a storage cabinet. "Let's take a look in the working files here," he suggested.

"Beware, rash Terry!" Whish shrilled, thrusting forward. "You compound your folly by probing into sealed records protected by the Yalcan Accord!"

"To which Groac does not subscribe, remember, Major," Magnan reminded him stiffly.

"Take a look at this, Mr. Magnan," Retief said, indicating a paper he had laid out on a table. Magnan went over, peered at it uncertainly.

"Why, whatever has a map of South Polar Continent to do with plate tectonics in the Voon area?" he asked his junior colleague, puzzled.

"Not much," Retief said. "But if that charge were planted a little further south along the mid-ocean ridge, say about here . . . ?" he indicated on the underlying map a point just off the coast of West Continent, near a chain of volcanic islands.

"Yes, yes, I see!" Magnan said excitedly. "That might well reactivate the vulcanism, with disastrous effects to the Beauteous Islands. But the Groaci would hardly be likely to destroy the idyllic Beauties, where their own aristocracy have established their villas as well as their diplomatic R & R facility." Magnan glanced at Whish, who was standing anxiously by, observing.

"Retief," Magnan said quickly, "I don't like that 402 of his. Too smug by half."

"That's not my 402, Ben," Whish corrected in his

thin, but confident tone. "That's my 721 (Self-assurance Born of Superior Knowledge, Legitimately Gained)."

"Sometimes," Retief put in, "rendered, 'If You Think You're So Smart, Let's See You Figure This One Out'."

"Only by envious non-diplomatic personnel not privy to the nuances of us professionals," Whish countered. "The very fact that you're aware of such crudities merely reveals your habit of hobnobbing with riff-raff."

"Speaking of riff-raff," Magnan said, "where's that Vug fellow?"

"Right here, Mr. Magnan," Vug called, from a locker next to the bool generator. "Looky what I found!" He emerged waving a half-unrolled chart.

"Happens I know these here waters," he commented, unrolling the map which, Magnan noticed, was of the icy southern seas. "Sailed them trackless wastes, Slub and boy, for thirty years!" he announced. "Look here," he went on, aiming a blunt finger at a series of red-printed contour lines at the north edge of the chart. "Old Morp Current, got slush in it's far as Bagbird Banks here—that's what makes the waters rich enough the Koomies never get far away."

"Well, what has your brutal Koom-innards industry to do with high-level matters of state?" Magnan demanded with some asperity.

"Plenty, which the Slubbese economy and all is based on Koomy-guts," Vug declared. " 'No Koomy-guts, no chow in the chow-bowls of the peasants', is what the recruitment posters say."

Retief had cleared away the overburden of miscellaneous papers and was studying the big chart Vug had unrolled on the table. Magnan glanced at the map's complex pattern of swirling colored lines indicating depths and currents, and turned away.

"We'd best get back to the Embassy at once, Retief," he said wearily. "And report our interim findings,

calmly, of course. If there's more to these schemes than we've yet unmasked, we may legitimately leave it to His Excellency to decide on a course of action."

"If he decides on a course of action, or inaction, more likely, without being in full possession of the facts," Retief pointed out, "it's unlikely he'll make a correct decision."

"Still," Magnan reposted, "the responsibility is his. That's one of the burdens of his high office. Happily, we are mere underlings who may safely leave these matters to our appointed superiors."

"Mr. Magnan," Retief replied. "I must take exception to your use of the word 'safely'."

Magnan gave him a shocked look. "You mean?" he stuttered. "Is it possible that this wretch—" he waved an arm toward Whish, "has arranged matters in such a fashion as to menace diplomatic members of an Embassy staff?" He turned to face the Groaci. "Whish, how *could* you commit such a breach of protocol?"

"Suicide, you mean, Mr. Magnan," Retief corrected. "If we go, he goes, too. Along with Ambassador Shish and the entire Groaci Mission."

"Absurd!" Whish hissed. "You've taken leave of your senses, Retief! I assure you, I do not seek immolation on this benighted pest-world!"

"What you seek and what you find are sometimes not quite the same, Major," Retief reminded the excited alien. "Remember your big plans for Furthuron, for example? That was one of Groac's more egregious miscalculations—but my money is on the Slubbese Affair to beat it."

"There *is* no 'Slubbese Affair', sir!" Whish stated coldly. "There is only selfless Groac uplifting the benighted. Like this rude chap here." He turned to confront Vug. "Do you, fellow, take exception to Groacian enterprise here on your backward planet?"

"I ain't no chap," Vug retorted stoutly. "And long's you don't mess up the Koomy grounds, I got no

complaints. Except maybe too many five-eyed flatfeet around town lately."

"I assure you, sirrah," Whish replied, "that only the minimal complement of Peace Keepers has been posted here to maintain order during these stressful times of change. You'll note they're guarding the Slubbese Treasury around the clock, as well as private stocks of valuables."

"Lay off, you're gonna make me cry," Vug protested. "But whycome our valuables are gonna need guarding? I got a hunnert and thirty-one sprug and sixty-five blun in my retirement account myownself."

"Merely routine precautions," Whish dismissed the matter.

While the others chatted, Retief was studying one document after another, referring frequently to the master chart. He called Vug over, and indicated a point on the chart. "Anything unusual you know of in this general area?" he asked the old salt.

"Well, I guess!" Vug confirmed emphatically. "That's the Throat of Goolgi, big old whirlpool can swallow a ship whole. Most dreaded spot on the six seas. How'd you know?"

"I saw it marked DANGER on another chart up topside." Retief told him. "Apparently the warm Wunt Current passes close to the cold Morp Current there, and sets up a cyclonic motion in the air which carries the water along with it, assisted by the Coriolis force."

"Yeah, sumpin like that," Vug agreed carelessly. "Some of the old timers say the reep catch is phenomenal just north of the Throat. Tricky navigating, getting in close enough to find the reep without getting caught. Reason reep fillets bring such good prices."

Whish had ventured close to the chart table, and canted a long ocular toward it. "After the blast," he commented, "that phenomenon will vanish—yet another boon conferred on Slub by Groacian technology."

"What blast was that?" Vug inquired. "Did I miss sumpin?"

"Just a little fireworks display the major was instrumental in arranging," Retief explained. "But, major, I have a hunch you were stretching the facts a trifle when you said you'd planted the big one three hours ago. I suspect you're running a little behind schedule, and in fact, have yet to set the detonator, which is why you were so eager to Tell All, and con Mr. Magnan and me down here, so you could tag along and look for a chance to slip away and complete your assignment."

"Absurd!" Whish whispered. "You read sinister intentions into the most innocent acts. Clearly, it was you who lured *me* here!"

"Sure," Retief agreed readily. "But look at this chart for a moment." He pointed to a stretch of open sea labelled 'The Demon's Hexagon'. "What would happen if your firecracker went off over here, a few leagues to the east of the spot you planned?"

"Why, that would totally obviate the entire purpose of the blast," Whish dismissed the idea. "That's quite clear of the mid-ocean ridge, and the tectonic repercussions would be negligible. Of course, it would create an eddy which might well influence the Morp Stream, to no end whatever. Why do you trouble yourself with these feckless speculations?"

"Let's go aft and see what's to be seen," Retief suggested, ignoring Whish's querulous remarks.

"Nothing's to be seen aft!" Whish protested at once. "Why not try forward, eh? It's closer, and not quite so dirty."

"Really, Major Whish," Magnan sniffed. "Your tactics are transparent. Aft it is. Lead on, Retief."

"It's Booch Day, remember, Mr. Magnan?" Retief replied. "Double-deception day, so he's trying to mislead us into believing he's misleading us. So let's go forward."

Whish's eyes drooped dejectedly as he trailed the Terran diplomats back topside to the chart room, Vug bringing up the rear.

In the navigator's office, Retief, carrying papers selected from the files, went at once to the pipe organ-like console of the big IBM 7000, punched the STATUS-REVIEW key and watched the numbers flash past on the digital read-out screen, while a strip of plastic clattered from the RECORD slot. He examined the latter briefly, then adjusted controls, picked up a stout drafting rod and inserted it under the edge of a closed cover marked in red in the long-tailed Groaci script ABSOLUTELY NOT TO BE TOUCHED UNDER LETHAL PENALTY and forced it open, not without a small tinkle of breaking metal. Whish screeched. Retief deftly punched in a complex pattern on the multi-colored needle-switch array thus revealed, then activated the CURRENT EXTRAPOLATE display accessory. A screen lit up, showing a computer-constructed view of the planet Slub, as seen from synchronous orbit above the equator, a greenish orb with prominent white-glaring polar caps, the whole wreathed in wisps of gray-white cloud cover.

"What in the world are you doing, Retief?" Magnan demanded. "We're in rather a hurry to report to the Ambassador, if you'll recall. Surely this is no time to play arcade games!"

"Somebody's already done my work for me," Retief replied, pausing to make an adjustment to the clock in the panel. "I intended to feed in the numbers I found below, and see what came out, but whoever was planning this little Booch Day surprise was thoughtful enough to work up a complete program for us to look at. This is what would happen if Whish's little blast went off on schedule."

"Confounded scientists-wallahs!" Whish hissed. "I

told the obstreperous fellow that everything was to be locked-in under GUTS security!"

"He did as you ordered, Major," Retief reassured the agitated Security-Groaci. "But as it happens, I broke your codes some years ago."

"Vile treacher!" Whish screeched. "All this time you've allowed the High Command to press on, elaborating large schemes for the greater glory of proud Groac, none of which was to eventuate due to your insidious meddling! It won't do, Retief," he added in a more controlled tone. "Thwarting the odd ploy here and there is one thing—and I see now why your obnoxious person has so often been witness to moments of frustration of the orderly unfolding of Groacian Destiny. But making jackasses out of the highest lords of Groac, as they solemnly confer in their secret conclaves deep in the sacred precints of the High Command redoubt—in full view of Terran nosy parkers—to be altogether Too Much! Better look out, Retief," he concluded. "When the word gets back, you will become the object of a Category Ultimate Kill Order. You've sealed your own fate this time. Bit too clever, eh?"

"Quite possibly," Retief agreed mildly. "But then there is always the question of whether anyone will actually tip off the High Command, eh?"

"Surely you jest," Whish came back sharply. "Do you imagine that I intend to remain silent after your revelation?"

"Time will tell, Major," Retief reminded the Intelligence officer.

"Speaking of sealed fates, Whish," Magnan put in. "Since you're the only one outside Retief and myself who is aware that your security has been breached, I'd not give a perished Rockamorran head-bladder for your chances of surviving to blab."

Whish's eye-stalks sprang erect, quivering. "You

don't mean. . . ." he whispered. "You're civilized diplomats! Surely you wouldn't. . . ."

"I wouldn't count on it, Bub," Vug counseled the Groaci as the later sprang for the exit, to meet Vug's large fist amidships. He rebounded and lay gasping on the deck.

"I've never seen a Groaci ocular display quite like that," Magnan remarked, watching the complex pattern of twitching of the fallen Groaci's stalked visual organs.

"I'm giving myself the last rites," Whish gasped.

Magnan's attention drifted from the excited alien to the screen, where a vivid yellow-orange spot had appeared against the dark gray of the ocean, at a point off the east coast of Southwest Continent. As he stared, concentric circles radiated from the glowing center, moving swiftly past the Beauteous Island chain, which failed to reappear afterward, and over the continental coast, moving well inland in a deep arc before breaking up and draining back, cutting new river channels in the newly deposited soil.

"Good lord!" Magnan yelped. "The blast sent a tsunami right across the Beauties, and flooded several hundred miles of farmland!"

"That was just the Phase One," Retief replied calmly. "Watch. I'll speed up the time-scale." He did so, and the single glowing point elaborated into a long chain of similar hot-spots, extending northwest and southeast. More giant waves assaulted the coast of South Continent, leaving extensive lakes and a modified shoreline in their wake.

"Why," Magnan squealed. "It's engulfed the entire Platinum Coast! And—and—what in the world!" He broke off to stare at the screen in astonishment as a new island, a long, narrow ridge, broached the sea, then was partially innundated to form a string of islands south and slightly west of the lost Beauties.

"That's right in the path of the Stream!" he managed at last. "It's diverting the warm waters east and south! North Continent will be exposed to the Polar currents: temperatures will drop far enough to reglaciate the Temperate Zone! Agriculture will become impossible! The planet will starve!"

"No, Mr. Magnan," Retief corrected. "They won't have time to starve—they'll drown, when the South Polar cap melts. According to Groaci calculations, the warm Stream will split and flow around the ice on all sides. Watch the screen."

The deeper-blue area representing the Stream was already swirling away from its immemorial easterly course to flow southward toward the pole.

"That's one year," Magnan noted on the time-scale read-out. "In two, the ice will be melting at a stupendous rate. I read somewhere that if the whole two miles thick cap melted it would raise sea level three hundred feet all over the planet—drown every major city on Slub! What are we to do, Retief!" Magnan turned his stricken gaze to his colleague, appealingly.

"You've shown yourself to be resourceful in the past, Retief," he groaned. "So *do* something!"

Retief turned to Whish, who was calmly watching the screens with two eyes, while the other three kept tabs on the positions of Retief, Magnan and Vug.

"On the other hand," Retief commented, "I don't think anything's going to happen after all."

Magnan clutched at Retief's arm, and all five of Whish's eyes snapped around to bear on him.

"But, but. . . ." Magnan managed. Whish uttered a crackling purr which Retief recognized as the Groaci equivalent of an indulgent chuckle.

"Look at the clock," Retief suggested to Magnan. "Five till five. If the big one was actually going up at five, the major wouldn't be so calm."

"Nonsense, Retief," Whish remarked cooly. "I told you five pee em, and five pee em it is."

"You're not a good liar, Whish," Retief said. "Your throat sac turns bluish every time. Regular built-in polygraph. But why lie about something so easy to disprove? All we have to do is wait five more minutes."

"To what end, my Retief?" Whish retorted in a tone of Mild Puzzlement Occasioned by Egregious Intransigence (1037-c).

"No need to get into the four-digit work, Whish," Magnan rebuked sharply. "Your sarcasm does you little credit," he added, then turned to Retief. "But why *would* he lie?" he demanded, averting his eyes from the clock.

"Just to keep us occupied trying to guess his motives, I'd say," Retief replied. "By the way, I set the clock ahead an hour, so don't be disappointed if the big hand gets to twelve with no fireworks."

"I shall endeavor to surpress my regret, Retief," Magnan said resentfully. "You might have told me, you know. For the second time today I'd prepared myself for death."

"Don't worry, Mr. Magnan," Retief consoled his superior. "It won't go to waste. Actually," he went on, addressing Whish now, "the fact is you haven't actually placed the detonator yet, have you, Major?"

"Why, wherever did you acquire that notion?" Whish came back in a crafty tone betrayed by the crossing of his middle pair of eyestalks.

"I noticed the special access hatch in the hold," Retief told him. "It still had the Department of Dirty Tricks seal on it."

"The Directorate of Diverse Tactics," Whish corrected sharply. "But what do you know of these matters, rash Terry?"

"Enough to read the code on the tag, tricky Groaci," Retief replied. "There's another matter that bears looking into, Mr. Magnan," he told the older man.

"Did you notice the section cut out of all three charts we looked at? The same material is missing from the archives here. Do let's see what the computer has to say about it." He took a step toward the console, and Whish, with a shrill cry, hurled himself into the big Terran's path.

"Stop, I entreat you, Retief!" he keened. "In the name of Allah, Buddha, the Great Worm, Odin, and Yahveh!" He broke off to utter a broken sob. "Let be, vile Terry!" he resumed, "You have probed enough into matters no man was meant to wot of!"

"Not quite enough, Major," Retief contradicted, almost kindly, as he stepped over the now prostrate Groaci, who clutched desperately at his ankle, only to be shaken off.

"What in the world?" Magnan spoke up in a shocked tone. "We've uncovered the plot within the plot—within another plot if you want to include the bomb scare at the office this morning. Goodness, was that really only this morning? It seems days!"

"Booch Day, remember," Retief reminded him. "The kindly Groaci were planning a real *tour de force*, eh, Major?"

"We strive only to better the plight of the confounded scum," Whish declared righteously.

"What's 'confounded' mean?" Vug demanded, reappearing at that moment. "I know Groaci lingo pretty good, but not all them big words, you know. What kinda scum did he say we are?"

"It is a term synomymous with 'enlightened'," Whish explained glibly. "It's the very best kind of scum."

"I don't like the sound o' that too good, neither," Vug told the cowering Groaci, smacking a ham-like fist into his palm. "How about it, Retief," he asked. "Is 'enlightened' good, or what?"

"It hardly matters, Vug," Retief told him. "All in

all, you could say the major wasn't being complimentary."

"You think maybe I oughta cave in his mush for him, in defense o' the national honor and all?" the old Slubbese sailor asked concernedly.

"Certainly," Retief advised. "But later—I want him in talking condition for a few more minutes."

"Such ingratitude!" Whish hissed. "After all that proud Groac has done for this backward world!" He subsided when Vug prodded his chitinous thorax with a rough-shod foot, eliciting a sharp *bonk*!

"No need to act hastily now, Retief," Whish cautioned, while attempting unsuccessfully to straighten the bent ribs in his hip-cloak, at the same time as he interposed himself in the Terran's path.

"Be not alarmed, Major," Retief counseled, sidestepping him. "It's only a computer work-up, you know." At the console, he consulted a document he had brought above from the technical area belowdecks, and punched new data into the machine.

"This is what would happen if the bomb happened to be placed just a little off target to the south," he explained.

"Unthinkable!" Whish shrilled. "To refrain from toying with such ideas, rash Terry!"

"Who said I'm toying?" Retief inquired mildly.

"Retief—Ben—I appeal to you. . . ." Whish turned his attention to the senior diplomat. "To cause this madman to stay his hand! No public relations campaign, no matter how shrewdly mounted, could conceal from Enlightened Galactic Opinion the enormity of the disaster such meddling would occasion—with Terra culpable, you may be sure! The Groacian Propaganda Ministry will see to it the facts are well publicized!"

"It's only a computer construct," Retief pointed out as he punched in new instructions. "Why all the excitement?"

"Aside from your own trivial fates," Whish hissed, "to be pegged-out on the sulphur pits of Yan would be a luxury cruise compared to my own! If—"

"Never mind, Major," Magnan cut in, "Retief's only playing with your nervous system."

"Or he's playing with mine," Retief corrected. "Take a look at this." He indicated the screen on which changes were now taking place.

"It's speeded up to a year per second," he explained. Now on the cloud-swathed orb glowing against the black of space with Big Moon a brilliant disc in the background, the color-coded oceanic currents swirled and shifted around new island chains, and the glaring white of new ice formations now crusted the southern half of West Continent, while the acreage of desert spread deep into the heart of East. Floods had obscured vast stretches of coastline on both sides of the troubled sea.

"Chaos!" Magnan commented. "How could they have contemplated such senseless vandalism?"

"They didn't," Retief corrected. "This one's mine."

"All that," Magnan mused aloud, "just from the detonation of a middle-sized nuke on the sea-bottom."

"All that and more," Retief corrected as he switched off the machine. "Now let's take that cruise."

"Whatever for?" Magnan wailed. "We should be rushing back to the Embassy to report Disaster unalloyed!"

"Wouldn't it be better," Retief countered, "to report Disaster averted?" He went past Magnan to the entry.

"Of course, but. . . ." Magnan whimpered, following.

"Vug," Retief called. "Let's get this tub to sea."

"Sure thing, boss," the former sailor agreed, and hurried belowdecks to see to the pre-castoff checklist, while Retief returned to the high-tech area.

* * *

Half an hour later, with the tubby vessel pitching sickeningly in the choppy waters as they ploughed out to sea through the bay-mouth, Whish keened in the background, while Vug looked over Retief's shoulder as he worked at the auxiliary hoist-control panel. "What you doing Retief?" he inquired. "That's a no-no, you know, messing with the special deep water sounding gear."

"Actually, this is the gadget which sets and activates the detonator, according to that manual Whish was so eager to throw overboard," Retief pointed out. "Next to it is the gadget that actually deposits the sonar gear, or, in this case, the bomb."

"I'll level wit you, pal," Vug said. "I don't feel too good putting to sea with a hell-bomb belowdecks."

"It won't be there long," Retief reminded his helper. "We'll have it in place in one of the Groaci's old test-holes in less than an hour. Meanwhile, you'd better get back topside and see if Mr. Magnan needs any help keeping Whish sedated."

"I clobbered him good last time up," Vug explained. "And Mr. Magnan's got him laid out on a bunk in the Captain's cabin, and the door's locked. He ain't going to cause no trouble. But I got to feed the nav them new coordinates you give me, now's we're clear o' the port and off automatics."

"Fine. I'll be through here in a few minutes, and then we'll try out the autochef," Retief replied. "This sea air certainly stimulates the appetite."

"My appetite's on permanent shore leave," Vug told his mentor. "Never put to sea yet I didn't get the cobblies soon's she starts to buck thataway. But I got to get back to the bridge." He broke off to hurry away.

Retief went along to confirm that the vessel was now at the precise location he had given Vug, then went below again.

Belowdecks, he went directly to the Don't Even

Think About Touching This classified hoist-control panel and checked dials. As he watched, a red light glowed suddenly, blinking DANGER!, and a needle snapped over against its pin.

"Good enough," Retief said aloud to no one. He activated a screen which glowed a murky green with a cloudy view of swirling mud, disturbed by the probe—a spidery crane-arm supporting a glistening ovoid with a red X on the side over the mouth of a black funnel-shaped pit. He manipulated a Waldo and the arm promptly dipped, lowering the ovoid into the opening. He released it and backed off the arm. After forty seconds, a green light lit up on the board. He checked the chronometer on the panel, compared it with the watch on his finger and hurried back topside. Magnan greeted him with a wail, Vug following, looking mournful.

"Retief! this time the moment has truly arrived!" Magnan wailed, "It's going to blow . . ."

"It's not aboard any longer," Retief reassured his colleague.

"You didn't simply jettison it!" Magnan yelped. "A blast of that magnitude will create disastrous effects! Why, we ourselves—this vessel, that is—will be thrown clear out of the water! She'll break up! Retief, you've doomed us all!"

"Take it easy, pal," Vug counseled. "I bet Retief knows what he's doing."

"I took the precaution of dropping it down an old hole," Retief explained casually.

"Even worse!" Magnan yelped. "Such irresponsibility! The consequences of a sub-crustal blast are totally unpredictable!"

"Not quite, Mr. Magnan," Retief countered. "The computer gave me a pretty good idea of what to expect. The first item will be a tsunami about a quarter-mile high, traveling outward from the blast

area at two hundred mph. We'd better get our stern to it fast, Vug."

Even as the surface heaved upward off the port bow, Vug leapt to the controls and pivoted the seaworthy vessel sharply so that the boil of white water took her squarely astern, bubbling across the decks as the ship lurched and acclerated like a body surfer riding a big one. The air was wet with blowing spume; then a downpour struck as the water thrown skyward fell back torrentially. Vug held on and steered, and *Challenger* sped on, her bow-wave curling back to merge with the boiling foam of the immense wave she was riding. At full power, Vug managed to pull the ship out from under the overhanging lip of the immense breaker as it collapsed thunderously behind. Magnan was busy at the ship-to-shore, speaking urgently of earthquakes and typhoons.

"Yippee!" Vug yelled. "Bet old *Challenger* never knowed she could do two hunnert knots! We'll make what's left o' the port in half a hour!"

Amidst howling wind, parallel gusts of salty rain, and the crashing of surf and collapsing dockside structures, Vug steered the ship directly into her assigned approach-control area and relinquished control to the Port Authority, stubbornly functioning in the face of the devasting storm so suddenly evoked by the suboceanic blast. Five minutes later, the survey vessel lay snugly in her covered berth, battered but intact. Retief turned Whish over to Vug, who dumped him carelessly down an unused coal chute.

"Serves the little sneak right," Magnan sniffed, feeling himself to confirm that he was actually intact after the wild ride ashore.

"Keep in touch, Vug," Retief urged the old salt as the latter disembarked hurriedly, muttering of exotic intoxicants and the comforting presence of a nubile female named Ook.

* * *

For half an hour, Retief and Magnan picked their way through frond-and-rubble-littered streets, deserted by all but a few half-clad looters, before they found a taxi cruising aimlessly.

"Oh, hi, Terries!" the driver called. It was the same battered-looking chap who had earlier delivered Whish to the wharves.

"I guess I was right when I seen you fellers headed for the Groaci's mystery-ship. I tole my mates, 'There's something afoot, mark my words', I tole em. And sure enough . . ." He looked happily about at the devastation. "A tidal wave and a typhoon hits within a half a hour. Figgered I might see you. Come on, let's get clear o' the waterfront before the next one hits."

His passengers safely inside, he sped away, swerving to avoid fallen timbers, collapsed billboards, uprooted trees and drifts of assorted rubbish left behind by the first shallow wave that had driven ashore ten minutes earlier, keeping an eye alert for the next inundation. He pulled up before the Terran Embassy with a squeal of brakes and turned to extend a hand.

"That'll be twenty-two fifty, gents," he announced, his voice almost lost in the howl of the gale. "You want me to wait, or what? Oh, boy, what a Booch Day! Ain't had so much fun since that Groaci cop got run over by a bus driver was busy saluting him!"

Retief and Magnan stepped out of the rocking vehicle into a Force Ten gale: Magnan uttered a yelp and almost fell; Retief grabbed him and hauled him across until he could get a grip on the ornamental iron railing. Inside the boarded-up glass doors, the Marine guard peered out dubiously, then opened up and let them into the comparative quiet of the shabby lobby.

"Hi Mr. Retief. Hi Mr. Magnan," the lad said. "What you doing out in that weather? His Nibs

ordered everybody home three hours ago. He's due in any time now, I unnerstand. Left word he wants to see you two gents."

"Hello, Henry," Retief returned the greeting. "Glad to see you defied that 'go home' order."

"Naw, I just didn't get the word is all," Henry protested. "Anyways— simplify, or whatever the old saying is. Simplify."

"Sounds like a good suggestion," Retief commented as the lift doors closed between them.

"Grotesque!" Magnan snapped. "The proper form is 'Semper Fi', of course. An abbreviation of the Latin *semper fideles*, meaning 'always faithful'. How could he mangle tradition so?"

"Beats me," Retief conceded. "Still, 'simplify' almost means something practical, which is more than can be said for 'semper fi'."

The door to the Chancery wing being open, they entered and went to the Ambassador's spacious tump leather and heo wood upholstered office and sat down. Outside the picture window, the wind shrieked, and there was a constant rattling of small flying objects impacting the building, which shuddered but held firm.

"Heavens, Retief," Magnan said breathlessly after his brisk dash. "I *do* hope he'll understand—the irregularities, I mean."

"It's the regularities you should be sweating," Retief pointed out easily. "Holding a diplomatic member of a Most Favored Planet's Embassy hostage is, after all, a standard ploy. But sending your Chief of Mission off on a wild moobie-bird chase is another matter."

"To be sure," Magnan agreed, steepling his fingers as one about to Clarify All. "Perhaps I *was* a trifle precipitate; still, it *did* seem expedient to tell the old buzzard—ha ha—His Distinguished Excellency, that is to say—that the world was about to suffer a bout of catastrophism."

"That part was all right, sir," Retief explained. "It was where you made up the part about the Groaci landing party, Peace Keepers and Legation staff, plus assorted Groaci tourists all rushing to the port and commandeering all transports, that you went a bit too far. Still, you can always deny it."

"Alas, it was directly to Miss Frumperts, his toady, that I passed the warning," Magnan mourned. "It's the next worse thing to having spoken directly to His Ex."

"You bet it was, Buster!" A harsh female voice snapped directly behind Magnan's chair, causing him to leap half way to his feet and freeze in a crouch, clutching his chest.

"I've told you and told you, Miss Frumperts," he gasped. "You mustn't subject me to sudden shocks. My cardiac condition, you know. Although I carry on stoutly through thick times and thin, I'm not a well bureaucrat."

"Was that 'stoutly' some kind of crack, Ben?" the Ambassador's private secretary demanded coldly as she maneuvered her three hundred pounds of basically unattractive protoplasm around behind the Great Man's desk.

"Now, I called you boys up here to tell you that as soon as His Excellency the Terran Ambassador Extraordinary and Minister Plenipotentiary gets back from his breakfast, he's got a few things to tell you about not making a jackass out of your boss."

"You mean, Miss Frumperts, that you passed that somewhat peremptory summons to Henry on your own initiative?" Magnan objected in a shocked tone. "Hardly appropriate, I think, for an administrative employee to take such a tone with senior diplomatic members of the Embassy staff."

"You can skip the whining, Ben," the portly stenographer dismissed his objection curtly. "What I really called you up here for was to give you a chance

to work out a viable version of the case before old Hairy actually hits the office. So don't get too smart for your own good. OK, Ben? I'm tryna do you a favor, fer crudsake!"

"Forgive me, Euphronia," Magnan pled brokenly, dabbing at an eye with one of the Ambassador's gold embossed tissues. "Damn monogram scratched me!" he complained abruptly, casting the offending serviette from him. "It's just. . . ." he fixed his bleary eyes on the major domo, ". . . .that I wasn't expecting such kindness after so much suffering. One is quite unmanned." He sobbed openly and took another tissue in which to bark noisily.

"Sure, Ben, I got compassion for yer hardships," Euphronia grated in an attempt at a soothing tone. "Let's get our script straight, now: you scared the pants off His Ex and then all you come up with is a high wind, not even a little bitty earthquake. He gets a rocket from that creepy little Groaci Chargé, Thilth, and right while he's in the middle of denying everything, that little wimp Whish comes charging in here in full view of the local yellow press! Bad tactics, Ben. The strategy don't look too good, neither."

Miss Frumperts paused to extract a dope-stick from the Ambassadorial humidor, perfunctorily offering one to her guests. She lit up, blew anise-scented purplish smoke in Magnan's direction, and continued. "Quite a fix you got yerself in, Ben," she commented offhandedly. "But maybe we can salvage something. Anything to this 'grand theft scow' rap?"

"Actually," Magnan gobbled, "it was Retief—that is to say, I'm sure he had excellent reasons for any apparent illegalities—or at least some kind of alibi." He paused for breath, snorting at the violet fumes now wreathing his narrow head. He made ineffectual batting motions as if to dispel the smog-patch, at which Euphronia snarled and ostentatiously snubbed out her dope-stick.

"You want it all, don't you, Ben?" she said bitterly. "Can't even let a girl enjoy a little pick-up without you got to start pulling rank. Ha! And me tryna help you!"

"But," Magnan protested. "I only, I didn't mean—why, heavens, I *like* choking on poisonous fumes!"

" 'Sarcasm is the last resort of the failed bureaucrat'," Miss Frumperts spat, turning her attention to patting her mummified coiffure, which made her plump face look like a plate of congealed lard set in a ragged ring of spongecake.

"Let's cut through the yackity-yak and get to the point," the secretary suggested in the peremptory manner she had acquired from long association with Himself. "Now," she went on relentlessly. "Number one: Retief here done nothing on his assignment to get the dope on the Groaci presence on the near moon, right?" Without awaiting a response she pressed on. "Then, youse broke up a local pot-house and humiliated a Groaci officer and his whole squad. Next, you violated Slub sovereighty by dumping a Groaci cop ranked light colonel in a dustbin, which he almost got compacted before a Groaci trooper pulled him out, scoring points for Groac. After that, lessee, you swiped the scow, and taken a Groaci diplomat hostage."

"Not hostage," Magnan cut in sharply. "He was an honored guest on the cruise."

"Then how come the Groaci Peace Keepers found him trussed up and dumped in a former coal bin?" Euphronia demanded. "Which they released him to come tearing over here making all kinds charges and all."

"Our local colleague, a patriot known as Vug, was perhaps a trifle overzealous," Magnan conceded. "But Whish made the mistake of trying to fake Vug into the coal bin first. That annoyed Vug and he retaliated."

"Sure, but this is all small tubers compared with

the Big One, which a deputation of top Slub scholars says you boys set off a underwater blast that kind of rearranged the sea-bottom off West Continent. . . ." she broke off to turn a candid gaze on Magnan. "Fer my part, Ben," she confided. "I don't see what it matters what goes on two hundred fathoms down, except maybe to a bunch o' fish."

"Well, you see, Euphronia—you don't mind if I call you Euphronia?" Magnan began uncertainly.

"I usually go by 'Gertie'," the corpulent typist corrected, coyly. "That 'Yufronya' handle is a downer my old man hung on me, which he wanted a boy."

"Very well, 'Gertie' it is, Gertie," Magnan gobbled. "Now, Gertie. . . ."

"Don't work it to death, Ben," Gertie cut in. "Get to the point. "You wanna plead insanity or what?"

"As for the preliminary atrocities," Magnan said crisply. "I can establish that I was elsewhere. As for my colleague, Retief, I'm sure he too can account for his activities."

"How about it, Retief?" Gertie turned a look like a slab of cold fat on the junior diplomat.

"As you suggested, Miss Frumperts," he replied, "it might be well to jump ahead to the Big One."

"OK, Gert, I'll take it from here," the irascible voice of Ambassador Hairshirt cut in sharply from his private entry behind the Terran flag. "You done a good job softening these boys up, Gert," he added, waiting with a clearly mimed impatience for her to abdicate his chair, which he then assumed, at once turning his gaze on Retief.

"Proceed, young fellow," he snapped. "You were just about to confess your complicity in an atrocity of truly breathtaking proportions." He leaned back expansively. "Indeed, I should imagine that the Inquiry accompanying the termination of your diplomatic career will be the sensation of the Twenty-Eighth Century."

"Mr. Ambassador," Magnan put in. "While pretending to carry out a deep-sea profiling mission to aid the Slubbish fisheries," he recited resentfully, "the Groaci in fact drilled a series of test holes, looking for precisely the right spot where crustal stresses were sufficiently delicately balanced that a few kilotons of ion-bomb would start things moving. The first plan was to accelerate the approach of North Continent to West from half an inch a year to a mile or so. In a few decades there'd be a collision that would pretty well clear things out and cloud the issues, thus leaving a power vacuum for the Groaci to move into. That had its drawbacks and was cancelled last week in favor of Plan Two: to melt the southern ice cap and shift the major currents, thereby also depopulating vast areas and making South Polar Continent available to Groaci pioneers. Just yesterday they realized they'd incidentally drown the Beauteous Isles where the Groaci run an R & R camp for burnt-out bureaucrats—so that was out. Then, it seems Major Whish, an undercover security man acting as advisor to the Groaci Sequest Commission, on its Grand Scheme, got a hot idea of his own." As Magnan paused, Retief made an adjustment on the small monitor screen he had brought along, then took up the account:

"When I checked on things belowdecks, I discovered that Major Whish had been detailed to oversee the planting of the bomb by automatic apparatus, but he'd fallen behind schedule, which required that the device detonate at five pm on Booch Day, and had conned us into taking her to sea barely in time to do his dirty work. And a quarter to five pm was now his deadline for planting the bomb in time for a fast getaway to the spaceport."

"You admit that this bungling conspirator enlisted your assistance in his fell schemes?" Hairshirt whispered, slumping in his chair.

"We pretended to be taken in," Retief corrected, "so as to get the major and his secrets and the bomb-placing capabilities all together at the right spot."

Hairshirt glared at Magnan. "Ben, you went along with this excessively devious strategy?"

"Well, Mr. Ambassador," the slender diplomat replied, "it hardly seemed right to interfere under the circumstances."

"What circumstances?" Hairshirt demanded. "You were senior, You had but to say the word!"

"But he's bigger," Magnan pointed out. "I had very little choice, actually."

"Mr. Retief," Hairshirt said in an ominous tone, his 1204, about a 'c,' Retief estimated (Oh Boy, Are You Going to Get It Now, Buster). "Such tactics are hardly in consonance with hallowed *Corps* policy."

"Precisely, Mr. Ambassador," Retief agreed. "It seemed to me that it was time to something more constructive than upholding tradition."

"Indeed?" Hie Excellency countered rhetorically. "Perhaps, Mr. Retief, you exaggerate the seriousness of the situation. It appears to me that Ben had matters well in hand before you, er, did whatever it was you did that upset Ambassador Shish sufficiently to call me via brown-line to cut short my visit to the Beauties."

"Actually, sir," Magnan put in quickly. "it's as well you returned when you did, since had Major Whish set in motion the Groaci scheme, the Beauties would have been engulfed by a tsunami of truly cosmic proportions—that's according to the Groaci's own 'most likely outcome' projection."

"Indeed?" Hairshirt smoothed his irregular features with a visible effort. "You mean that Minister of Stuff Goob and his entire staff are . . . ?"

"To be sure," Magnan confirmed. "Still, Your Excellency was spared. That is . . ."

"Mr. Magnan means that the Groaci would have scarificed the Minister of Stuff and all other personnel on the islands, had their scheme proceeded beyond the projection stage."

"Inhuman!" the Ambassador blurted, gripping the arms of his hip-o-matic chair and thus inadvertantly causing the power swivel option to rotate the chair in a fast 720. "Ghastly!" the startled passenger yelled. "Stop this thing!" He clung, his eyes tight shut and his face mottled with fury as the chair spun him around and around and, still whirling, advanced to the wall behind the desk and rammed it hard, continuing the furious rotation in obedience to its victim's frantic grip on the control panel set in the arm. Magnan leapt forward, was rewarded by a solid kick in the knee by the Ambassador's outflung foot. Retief stepped in and forcibly pried the Ambassador's hand from its convulsive grip and stopped the chair.

"Treason! Sabotage!" Hairshirt yelled as he staggered from the treacherous seat. "Magnan! Find the malefactor responsible for this outrage and see to it he's shot!"

"You did it yourself, sir," Magnan pointed out diffidently. "That is, the chair did it, of course, but you were pressing the control." The unhappy Second Secretary went to the chair and righted it.

"I don't care!" Hairshirt yelled. "Shoot him anyway!"

"Mr. Ambassador," Magnan said solemnly. "I shall take the liberty of ignoring that order, as I'm sure you'd regret it in the morning."

"Only until sunrise," Retief pointed out.

"Sink the Beauties, you say," Hairshirt shouted, returning to official business like the seasoned professional he was. "Dastardly! Lacking a hill station, where would I go when the press of business became too great? Goob, too," he reflected more calmly. "Decent sort of chap, actually, for a Slubbese. So the question now confronting us is: what just and pas-

sionate revenge—ah, response shall we choose to this atrocity?"

"Dispassionate, sir," Magnan corrected his chief.

"Who could be dispassionate?" Hairshirt demanded, "when the finest little gambling hall-cum-steamroom, complete with the niftiest little masseuses west of Madam Cleo's, has just been washed away by a tidal wave—just when I had my system perfected, too! Little Peaches, Frou-Frou, and Hammer-hips, too—all gone, cut down in the flower of their nubility!"

"Not actually, sir," Magnan reminded his irate boss. "You'll recall, sir, that I—that is, Retief and I, actually—averted that disaster by substituting a completely different disaster of our own."

"To which action I presume I can ascribe the tornado now demolishing the city," the Ambassador snapped with a sour glance at the window beyond which the air was filled with wind-driven wastepaper, wooly-tree fronds and other movables.

"More of a hurricane, actually, sir," Magnan corrected. "Yes, I suppose it *is* a direct consequence of our prompt action in switching targets, but at least Your Excellency is alive to experience it."

"There is that," Hairshirt acknowleged shortly. "But of what avail to survive drowning only in order to be crushed in the rubble of a collapsing Embassy?"

"It probably won't come to that, Mr. Ambassador," Magnan hoped aloud. "The projection shows the eye moving east at nine miles per hour. The worst will soon be over."

"And what other phenomena, if any, may I anticipate due to your unauthorized activities?" the Chief of Mission demanded in a discouraging tone.

"There wasn't time," Magnan offered brokenly. "No time at all. The way it was, you see, sir, the hell-bomb was armed and on final countdown. We couldn't stop the detonation. The best we could manage was to relocate it. Had we simply allowed it to

blow in its cradle aboard the survey vessel, not only would we have been vaporized, but the city itself would have been levelled, and the disturbance to the tides would have had repercussions involving the erosion of the peninsula on which the city is situated, and the cutting of a new tidal channel up north, across the fatlands."

"The fatlands, Ben," Hairshirt intoned, "are the chow-basket of Slub. How can you discuss so calmly the prospect of starvation on a planet-wide scale?"

"I'm not calm!" Magnan riposted heatedly. "And it wasn't me, er, I, who was planning to starve Slub. . . ."

"Oh, Retief, eh?" Hairshirt purred. "Might have known. . . ."

"Not him, either—er, he neither, I mean!" Magnan gobbled.

"Ben, Ben," Hairshirt chided. "This is no time for grammar. So, after you planned to subject the people of Slub to slow starvation, I presume you'd have proposed a massive aid program, rushing in supplies from Terra to forever win the hearts of the survivors. . . ."

"Not quite, Mr. Ambassador," Magnan protested. "No one planned to destroy the fatlands!"

"You mustn't try my indulgence too far, Ben," Hairshirt reproved gently. "I distinctly heard you refer to the cutting of a tidal channel which would have reduced the fatlands to a salt marsh."

"Sir," Magnan protested. "I didn't say a word about a salt marsh!"

"Never mind, Ben; the idea is not entirely without merit," Hairshirt said soothingly. "With most of the indigent, indigenous—forget it:—anyway, with only a few grateful survivors around, Terran influence would become the dominant force in Slubbese affairs."

"So what?" Magnan demanded, still smarting from

the Ambassadorial implication. "What do we want with this pest-hole anyway?"

"Ben, would you fly in the face of the most cherished tradition of the Corps? True, wisdom would seem to suggest that we saddle Groac with the burden of trying to bring order to this chaotic world. But then we'd lose points, don't you see, Ben? Like in Korea and Viet Nam, back in early historical times."

"Still . . ." Magnan protested and lapsed into silence.

"Don't brood, Ben," Hairshirt urged. "You're learning—albeit slowly, as shall be duly noted in the Unlikely column of the Developmental Potential section of your next ER. Now, Retief," Hairshirt shifted his sights. "You may proceed to detail the disaster you claim to have precipitated in defiance of *Corps* policy and my own specific instructions, while you ignored the task I had set you, to secure intelligence regarding Groaci's fortifications of Big Moon."

"The bomb was ready in the delivery probe," Retief explained. "Armed and counting, ready to be placed. I took the liberty of redirecting it from the bore hole in which the explosion would have activated the Old Fault and closed up West Sea within a few decades, and instead put it in a test hole bored earlier in the program."

"And what, pray, did this accomplish?" Hairshirt demanded.

"It caused the rift in the Polar plate to open, dividing Polar Continent into two sections, one of which rotated in response to the Coriolis force, closing off the sea passage south of West Continent. As a result, the Tidal bulge is now unable freely to equalize itself, and a permanent standing wave exists in the south Western Sea."

"While the circumstances you detail seem mild enough," Hairshirt stated judiciously. "The fact remains that at the moment a typhoon is raging on a

scale unprecedented in meteorological history. And the Groaci are still in full possession of Big Moon, and what they are doing there defies imagination. Am I to report to Sector that having detected the criminal activities of the Groaci anent the satellite, I then stood by inactive, and permitted their scheme to proceed to fruition?"

"I wouldn't if I were you, Mr. Ambassador," Retief counseled. "I respectfully submit that what the Groaci do on Big Moon will be of no importance whatever."

"That, sir, is for *me* to determine!" Hairshirt yelled. "You forget yourself, Retief! It is *I* who am Chief of Missions here, and I say . . ."

Retief held up a hand. "Permit me, if you will, Mr. Ambassador, to mention the computer projection before committing yourself," he interjected between Ambassadorial yells.

"I can imagine nothing your precious computer could divulge which would influence my stated policy regarding illegal Groacian adventures within my area of responsibility!" Hairshirt shouted after drawing a breath sufficient to power the lengthy period.

"How about this," Retief suggested. "The tidal bulge on Slub exercises an attraction on Big Moon equal to one percent of the total system interaction. With the standing wave proceeding two degrees in advance of the Slub-Moon center-to-center line, it exercises a tug in the direction of Big Moon's orbital travel. As a result, the satellite's orbital velocity was increased by about ninety-five miles per hour." As Retief paused, Hairshirt resumed:

"What the devil do I care about that? So now I'll have the nuisance of having the lunar calendar recomputed, as if I hadn't enough problems! It appears, Mr. Retief, that all this astronomical triple-speak is no more than a red herring to distract my attention from your abysmal failure to so much as attempt to

carry out your assignment vis-à-vis the Groacian plans for military aggrandizement."

"The more aggrandized the better," Retief responded. "Terran policy should be to encourage the Groaci to continue pouring their cash and technology into the Big Moondoggle."

"You would pusillanimously give up and permit Terra's prime antagonist to take over?" Hairshirt yelled, his overstrained voice a high-pitched squeal now.

"May I point out, Mr. Ambassador," Retief offered quietly, "that as its orbital velocity increases, the orbit itself must accommodate by becoming larger. In other words, the moon is now spiraling outward, receding from Slub at a rate of over a mile a minute. In a few hundred years, about the time their Thousand Year Plan is entering its final phase, Slub will be no more than a medium bright point of light in the lunar sky. The impregnable fortress will be too far away to have any effect on affairs on Slub, or on the trade lanes. In Ten Thousand years or so, Big Moon will be firmly in orbit around the star."

"And the surface temperature . . ." Hairshirt paused to manipulate the calculator set in his desk top . . . "will be hot enough to melt copper. So much for sophisicated Groacian circuitry, eh, boys? Well," Hairshirt rubbed his palms together with a sound like a cicada grooming its wing cases. "It looks as if I've done it again, and all in the finest tradition of Booch! Thanks for your help, though of course it was no more than your duty thus to implement your Chief's policies. By the way, Magnan, don't worry about the trifling damages to Corps property. And you say the Beauties aren't really devastated? In that case, I shall resume my va—conference with the Slubbese authorities, at once. Ta, fellows, and don't get caught in the storm."

EDITOR'S INTRODUCTION TO:

ESCAPE FROM PLANET EARTH

This article is an expansion of a piece that made major waves on its appearance in the *Wall Street Journal.* (Unpaid, unsolicited plug: if you don't read the *Journal,* you are either under-informed or you have sources unknown to me. But I digress.) The *Journal* article stirred up such a flurry of protest that it may actually have averted the danger of which it warned. It also bestirred this editor to offer Harry a permanent perch, "THE SPACE BEAT," from which he could beat would-be space-bureaucrats about the head and shoulders until they give up and go away, or the rivers cease to flow. (Any bets as to which happens first?)

Introducing (are you ready?) The Rocketocracy. Yes folks, after nearly thirty years in space without it, Federal Alphabet Soup is threatening to infect the cosmos with its patented can't-do spirit. Where's *Retief*??

—JPB

Escape From Planet Earth

G. Harry Stine

Once upon a time, all that was necessary to escape from Planet Earth was to launch a rocket capable of achieving a velocity of about four miles per second. In 1955, when the Vanguard project was announced, getting anything into low Earth orbit (LEO) was one of the most difficult technical feats imaginable. Since 1945, rocket engineers had been theoretically capable of building a space launch vehicle capable of the required velocity. But, in the United States, there was no official interest in space flight and therefore no money available to allow the engineers to build.

So they did the best they could with available hardware, such as the German A.4 (V-2) left over from World War II, sort of a war surplus space rocket. In 1949, Robert P. Haviland of General Electric (who was running the U.S. Army Ordnance Corps' V-2 project at White Sands) showed what could be done by mating the JPL research rocket, WAC-Corporal, to a V-2 and getting the two-stage "Bumper" vehicle up to an altitude of 249 miles over White

Sands, New Mexico. Until the Korean War, practically all US rocket work was carried out for scientific exploration of the Earth's upper atmosphere. However, although the rocket technology was up to building an orbital launch vehicle if pushed a little bit, guidance technology was marginal even as late as 1955. There were few guidance engineers who believed it possible to achieve an orbital insertion velocity vector of plus-or-minus two degrees.

But technology has a way of progressing. What is impossible to one generation of engineers is difficult to the next and commonplace to the third. In nearly any elementary schoolyard in the United States today, students are launching little model rockets that have better performance than the original liquid propellant rocket flown by Dr. Robert H. Goddard in 1926. Every year at Smoke Creek, Nevada, amateur-built experimental rockets routinely achieve altitudes in excess of twenty-five miles—far better performance than most 1945 research rockets. Inertial navigation systems used in most long-distance airliners have accuracies far greater than that required to steer a space launch vehicle.

Therefore, if your goal is to launch a moderately-sized payload into LEO, designing and building a suitable launch vehicle is no longer very difficult from a technical standpoint. There are at least two generations of aerospace engineers who have done it and can make their know-how available to keep the new generation from re-inventing the wheel. In 1986, the technology to build LEO space launch vehicles is state of the art, in place, and available just for the using. Space launch vehicle technology is the least and simplest of the problems involved with escaping from Planet Earth.

Nor is there an insoluble problem involved with getting the necessary money—about a hundred million dollars of venture capital. Entrepreneurs raise a

hundred million dollars in venture capital on an almost daily basis for schemes offering perceived low risk and minimal government regulatory involvement.

As of this writing, there have been at least two privately funded, privately designed space launch vehicles put on the launch pad. The first was the Percheron built by GCH, Inc. of Sunnyvale, California; it suffered an unfortunate "hard start" during an ignition test on its Matagorda Island, Texas, launch pad in 1981. The next was the Dolphin, designed and built by Starstruck, Inc., also of Sunnyvale, which was launched from the Pacific Ocean off California and suffered an in-flight failure. However, it's important to realize that in both cases these groups of space entrepreneurs got hardware on the pad and a fire lit under it. In the long history of rocketry, there hasn't been a single rocket design that hasn't suffered a "catastrophic disassembly" at some point in its development. The first successful German V-2 flight at Peenemunde during World War II was Round Number Four. The first V-2 was destroyed on a static test stand and the first two flight versions blew up.

American rocketry hasn't been all successes, either. Nearly everyone remembers Vanguard TV-3 blowing up at launch in December, 1957. Few people know that the Army's Jupiter-C rocket, a cobbled-up Redstone, had a history of failures as it blew and sputtered and chugged its way to being the first successful American satellite launch vehicle. And I won't tell you how many model rockets blew up or failed for me from 1957 to 1960 while we discovered all the things that shouldn't be done.

So private launch vehicle technology is here and available. If you don't want to develop a launch vehicle, you can buy a ride for your payload aboard a rocket purchased from American, European, Chinese, or Soviet suppliers. It's not really possible to

buy a "surplus" rocket capable of doing the job, although Space Services, Inc. of Houston, Texas, managed to "borrow" a Minuteman M56A1 second stage to propel their Conestoga I. (It's never been explained to me how SSI managed to do this because, even as surplus, the Minuteman M56A1 rocket motor carries a Department of Defense security classification. Unless you and your crew possess the proper defense security clearances, you can't get a Minuteman M56A1 no matter how much money you've got . . . at least theoretically.)

Even though LEO launch vehicle technology is available, however, a prospective space entrepreneur now must contend with the machinations of a capricious United States government.

Yes, it is indeed the stated policy of the Reagan administration to foster, encourage, and support the development of private commercial space ventures and the space launch vehicles they require. However, in so doing, the federal government now finds itself caught in a trap it unknowingly set for itself by becoming State Party to two UN space treaties. In the process, it is in the process of adopting some federal laws, regulatory policies, and regulations that not only conflict with the Constitution and other federal laws but are also paradoxical. In other words, the federal government is suddenly discovering that it's created a Catch-22 situation for itself that will, unless it's rectified, hand the solar system over to the Soviet Union, the Chinese, the Japanese, and the Europeans—lock, stock, and planetoids. And, as might be suspected in Washington, it appears that the right hand knoweth not what the left hand doeth. The White House may not be aware of the exceedingly restrictive regulations now being put into place by the federal bureaucracy.

Paradoxical problems don't bother an organization possessing a bureaucracy as large as the United States

government. Nor do the multitude of rules, regulations, executive orders, and OMB restrictions placed upon it in an attempt to control it. Congressional mandates that freeze civil service hiring, grade levels, and promotions seem to have no effect. The same holds true for executive orders prohibiting the promulgation of regulation after regulation in spite of a stated policy of supporting de-regulation. For example, OMB Executive Order 84-9 was promulgated in October 1984; it requires all federal agencies to submit to OMB for review a calendar of regulations proposed for adoption during the following fiscal year. After six months of trying to get a copy of this Executive Order from every possible Washington source, I have not received one as of this writing and have come to the conclusion that the order either doesn't really exist or has been bureaucratically buried in such a way that it will never see the light of day. The bureaucracy is capable of doing some wondrous things.

If nothing else, this strange, wild, weird, and wonderful behavior justifies the District of Columbia as deserving the vulgar apellation, "Disneyland on the Potomac."

Since my article, *Cheap Shots*, was written in 1984 and appeared in *FAR FRONTIERS*, *Volume II*, Summer 1985, an amazing series of events has taken place that deserves to be brought to the attention of persons interested in the far frontiers of space and nurturing the hope of getting there themselves some day.

The most important of these is this simple fact:

Gang, while they were telling you what you wanted to hear about free enterprise in space and of their support of the principle of getting people out there on a regular and self-sustaining basis, they went around behind the barn and effectively locked the gate on you before you could get out. Unless you have a lot

of money, friends in high places and know where some political bodies are buried, there is no way that you are going to get into space without a government permit or license. By regulatory decree, the United States government has foiled your escape from Planet Earth.

Let's go over it, chapter and verse, with dates and names exposed for the world to see.

On January 30 to 31, 1981, during the first meeting of the Citizens Advisory Council on National Space Policy held in Tarzana, California, and chaired by one of the editors of this magazine, a group consisting of space entrepreneur Gary C. Hudson, science fiction author Larry Niven, Houston space lawyer Arthur M. Dula, and myself wrote a policy position paper entitled, "How to Save Civilization and Make Some Money." We recommended policies and actions the new administration could adopt which would "unleash the engines of free enterprise in space." The paper was part of the first Council report (available from the L-5 Society, 1060 E. Elm St., Tucson, Arizona 85719) and was shortly thereafter read in the highest offices in the land. It still seems strange to hear my own words coming back from the Oval Office.

On July 4, 1982, President Ronald Reagan announced his administration's new National Space Policy which can be summed up in his words: "The United States Government will provide a climate conducive to expanded private sector investment and involvement in civil space activities."

Congress followed this lead. The Committee on Science and Technology of the House of Representatives announced in a report dated April 15, 1983, "We should establish a policy which would encourage commercialization of space technology as rapidly as feasible." The United States Senate's Committee on Commerce, Science, and Transportation followed

on May 16, 1983 with a report which stated, "The Committee is fully supportive of efforts by the private sector to invest and seek commercial opportunities in space."

And Congress got to work on several bills that purported to turn those words into federal law.

As reported in my article, *Cheap Shots*, the proposed launch of the Conestoga I rocket paid for by Space Services, Inc. of Houston, Texas, was preceeded by an incredible act: people from SSI went to Washington and *asked bureaucrats to issue whatever permits were needed to launch!*

Since 1958, I've been involved at the interface between rockets (albeit little model rockets, although there are a lot of rockets differing only in size, mass, and power) and bureaucrats (who come in only one make and model). One of the things I learned very quickly was that one should *never* ask a bureaucrat for permission to do *anything*.

The longshoreman philosopher Eric Hoffer has observed correctly, "In a free society, it is necessary to spell out what people cannot do, while in an authoritarian society, it is vital to spell out what people can do." The task of most bureaucrats is to realize this bit of philosophy by determining what you and I as free people *cannot* do. They perform this function very well, and we even pay them to do it. They also seem to work very hard at converting America into an authoritarian society because they have a habit of trying to tell people what can be done.

The Washington bureaucracy—*any* bureaucracy—is what is known as a "negative power system"—i.e., there are many bureaucrats who have the power to say no, but few, if any, with the power to say yes. Even if the bureaucrat has never even thought about what a citizen intends to do and has absolutely no knowledge whatsoever about it, when asked for his permission he will promptly say no. This covers his

anatomy in case the citizen proposes to do something that might somehow be construed to be in violation of the plethora of federal laws and regulations. However, if pushed hard enough by the right forces or gently threatened by political pressures, he will then proceed to *find* some law, rule, code, or regulation that gives him *de facto* control over whatever it is you intend to do—and he will then assume control.

Prior to SSI's abysmally stupid move, all that was required in order to launch any unmanned rocket weighing more than one pound and propelled by more than four ounces of propellant was to notify the local representative of the Federal Aviation Administration (FAA) of the time and place of launching, the number of rockets to be launched, the altitude to which the rockets were expected to go, and the names and addresses of the responsible persons. On a state or local level, there may have been some other notifications required or permits to be obtained, but these are usually relatively easy to get. But insofar as the federal government was concerned, compliance with the requirements of the Federal Aviation Regulations Part 101 as outlined above was all that was necessary.

But when SSI tickled the Washington bureaucracy with the outlandish request for whatever permits were necessary to launch a private rocket into space, the bureaucracy reacted as expected. The Department of State's Munitions Export Control Branch; the Department of Treasury's Bureau of Alcohol, Tobacco, and Firearms; the Department of Defense; the Department of Transportation Hazardous Materials Transportation Branch; and a bevy of other government bureaucracies discovered they had some rule, regulation, or legal authority that could be interpreted to require the issuance of some sort of license or a permit that would apply to a rocket intended to be launched into outer space. SSI played

it safe. It got all the licenses and permits required by the bureaucracy. This precipitated a bureaucratic turf battle of monumental proportions. The only way out of this incredible bureaucratic civil war was to enact a federal law assigning to a single government agency the jurisdiction over private launch vehicles.

House Resolution H.R. 3942 was passed by Congress, became Public Law 98-575, and was signed by the President on October 30, 1984. It is now the law of the land (98 Stat. 3055, 49 U.S. Code 2601). It is referred to as the "Commercial Space Launch Act." Apparently, few space entrepreneurs and advocates have read it carefully. Otherwise, there should have been an outcry about it long before this because, it's far more restrictive than the ill-fated "Moon Treaty" that was so effectively opposed by space advocate groups such as the L-5 Society.

Call your congressman's office. Get a copy of Public Law 98-575. Read it for yourself. Be prepared to stifle your sobs.

Following many high-sounding phrases in the "Findings" and "Purposes" sections of the Act, Section 4, "Definitions," begins the nitty gritty of legality. *Always* read the "Definitions" section of any law, rule, or regulation, because this part sets forth the meaning of the words that are used therein—which may not be the same meanings that are assigned to them in the everyday world.

Then comes the kicker. Responsibility for carrying out the provisions of the Act is assigned by the Act to the Secretary of the Department of Transportation. DOT is given the authority and the responsibility for writing the necessary regulations to implement the various provisions of the Act.

Then, Section 6, Requirement of License for Private Space Launch Operations, says:

"Sec. 6(a) (1) No person shall launch a launch vehicle or operate a launch site within the United

States unless authorized by a license issued or transferred under this Act.

"(2) No United States citizen described in subparagraph (A) or (B) of section 4(11) [This defines a United States citizen as any citizen of the United States or any corporation, partnership, joint venture, association, or other entity organized and existing under the laws of the United States or any State] shall launch a vehicle or operate a launch site at any place which is both outside the United States and outside the territory of any foreign nation unless authorized by a license issued or transferred under this Act."

The Act goes on to expand this prohibition to include any payload as well.

Finally (but not last), the Secretary of Transportation is empowered to prevent the launch of a space launch vehicle and/or payload if "the Secretary determines that the launch of such payload would jeopardize the public health and safety, safety or property, or *any national security interest or foreign policy interest of the United States*." (Emphasis added.)

Have we heard those words before? And have they been used by the Federal government to justify almost anything that the Federal government wants to do?

On the other hand, nothing in the Act applies to anything the United States government wants to do.

Is this sheer regulatory power-grabbing on the part of the Federal government? Or is there something else behind it?

The latter is probably 99% the case, with the remaining 1% (perhaps) being sheer power-grabbing.

The United States of America is a State Party to the United Nations' Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 18 U.S.T. 2410, 610 U.N.T.S. 205. Under this treaty, non-governmental activities in space

require the authorization and continuing supervision by the appropriate State Party. There is nothing essentially new or different about this concept. The same principles apply to maritime vessels and aircraft registered in the United States.

But the United States of America is also a State Party to the Convention on International Liability for Damage Caused by Space Objects, 24 U.S.T. 2389. Under this treaty, the federal government agreed to assume the liability for damage caused by US space objects, including *absolute liability* for damage to life and property caused by any space object when it's launched from US territory or if the launch is otherwise conducted or procured by United States citizens.

Gee, it all sounded so nice and neat when it was proposed by the United Nations' Committee on the Peaceful Uses of Space, didn't it? Little did we suspect that it might end up preventing individuals such as you and me from going into space unless the government issued us an exit permit to space certifying that we were true-blue, 100% Americans.

This all sounds suspiciously like a totalitarian dictatorship wrote it. And the biggest and most repressive totalitarian dictatorship in full swing today exists in the socialist nations, especially the Union of Soviet Socialist Republics.

Several prominent space lawyers readily admit that behind the UN Treaties are the continuing efforts of the USSR to bottle up free enterprise capitalism on this planet and to reserve outer space for the exclusive use of socialistic state capitalism instead. One thing for certain: the Soviets certainly know how to stack the deck in their competitive favor. The USSR makes the so-called "big oil companies" and the "big auto companies" and the "big electric utilities" look shabby when it comes to this sort of thing because the Soviets manage to do it on a worldwide basis.

Okay, maybe the United States had to adopt such a law to conform to the provisions of the treaties to which it is a State Party. Such treaties have the power of Federal law once signed by the President and confirmed by the advice and consent of the US Senate.

The Commercial Space Launch Act of 1984 might have sat there quietly for years with very little fuss being made about it if the Act had not directed the DOT to promulgate a set of policies and regulations for implementation of the provisions of the Act within 180 days after signing. These implementation policies were written up by Jay Stepto of the DOT General Counsel's Office and published in the Federal Register on 25 February, 1985, with comments solicited on or before 25 April, 1985.

The published DOT policies for implementing the licensing and permit requirements caused an uproar among space advocates (at least, those who knew of or learned about them in what must have been the best-kept government secret of 1985). The DOT lawyers latched onto Section 8 (b) of the Act, which states, "The Secretary may, with respect to launches or the operation of launch sites, prescribe such additional requirements as are necessary to protect the public health and safety, safety of property, and national security interests and foreign policy interests of the United States." Additional power was delegated to DOT in Section 6(b) (1) and (2) as follows: "The holder of a launch license under this Act shall not launch a payload unless that payload complies with all requirements of Federal law that relate to the launch of a payload . . . If no payload license, authorization, or permit is required by any Federal law, the Secretary may take such action under this Act as the Secretary deems necessary to *prevent the launch of a payload* by a holder of a launch license under this Act *if the Secretary determines that the*

launch of such payload would jeopardize the public health and safety, safety of property, or any national security interest or foreign policy interest of the United States." (Emphasis added.)

This is an enormous amount of discretionary power to be vested in a government agency. The wording is very "soft." The terms "public health and safety," "national security interest," and "foreign policy interest" can be used to cover a multitude of sins.

DOT used this authority in its proposed implementation policy to suggest a "Mission Review" requirement as part of the procedure for obtaining a license. The DOT Mission Review would focus on such factors as the purpose and character of the proposed payload, the nature of the payload, and the impact of the launch or payload on existing uses of space. Comsats and other payloads which are licensed by other Federal agencies such as the FCC will be considered by DOT as having complied with the Mission Review requirements. But: "Payloads which are not independently licensed will be reviewed by DOT in consultation with the Departments of State and Defense and, as appropriate, the National Aeronautics and Space Administration and other agencies to ensure that the payload mission does not conflict with national interests."

What are "national interests?"

Answer: Just about anything the Federal government happens to define as "national interests" at any given time.

For example: Is it in the "national interest" to ensure that the space shuttle is used to its capacity? If so, a license to launch a payload on a private booster could be denied. "You must fly it on the shuttle because there's plenty of available room."

The Federal government now has a virtual monopoly on space transportation with the shuttle. Suppose Acme Space Launch Company comes up with a cheap,

safe, reliable booster whose launch costs are half that of NASA's. Is NASA going to stand by idly while its expensive shuttle flies with available room in the cargo bay? NASA currently objects to payload customers flying on the Eurospace *Ariane* booster, which has slightly lower launch costs. NASA complains that *Ariane's* costs are low because of subsidization by European governments, yet more than half of the shuttle's true launch costs are subsidized by the American taxpayer. Under the Act, NASA has review authority over all payloads not otherwise Federally licensed. Would NASA act to give a thumbs-down because of any one of a number of potential reasons to the launch of a payload on a cheap private launch vehicle? Answer: Probably, because if the authority is there, it will undoubtedly be used. A monopoly behaves the same, whether it be private or governmental.

And not every launch vehicle or payload is going to do things that NASA will approve of.

NASA, DOT, and other government agencies have been addressed herein as if they were monolithic entities all of themselves. They aren't, of course. There are some honest, trustworthy, hard-working individuals in all of them; otherwise, those agencies would have collapsed long ago. But, because Federal agencies are groups of people just as any private company is, there is no reason to believe they will act any differently than a corporation faced with competition or a threat to turf or expertise. This has been proved by the way some NASA individuals reacted to the Percheron (see *Cheap Shots*, cited previously).

Is there a solution to this dilemma? Yes, but it will take some work to make the changes because, once a Federal law or regulation is in place, it's damnably hard to change it. But it can be done, and there are several avenues of approach that can be taken to regain

freedom of space, which we've just lost because we weren't paying attention.

A few years ago, Senator Barry M. Goldwater (R. Ariz.) sued the Carter administration over the power of the President to abrogate an international treaty: the agreement concerning the Panama Canal, in fact. The Federal courts held that, although the United States cannot become a State Party to any treaty without the advice and consent of the US Senate, the United States can withdraw from the same treaty by an executive decree of the President. President Reagan could simply declare that the United States was no longer a State Party to the ridiculous UN treaty on space liability and announce that the policy of the United States with regard to such liability was the same for spacecraft as for aircraft—i.e., the *owner* of the aircraft or spacecraft is liable, not the state of registry. If I'm flying my airplane in Mexico and happen to ding the chimney of a tortilla factory, I'm liable, and not the government of the United States of America.

Arthur M. Dula, one of the foremost space lawyers, has pointed out that a treaty to which the United States is a State Party is like a Federal law. The Congress can also abrogate a treaty by passing one or more Federal laws negating all or part of the treaty. Considering the fact that Congress seems to be far more capricious than other segments of the Federal establishment, your guess is just as good as mine when it comes to figuring the odds on getting Congress to adopt a revised Commercial Space Launch Act, or even rendering the United States government immune to liability for space objects.

There is little chance of heading off restrictive regulations in DOT. That agency *must* adopt regulations using the wording of the Act.

Or, you can risk a fine of $100,000 for violating the

Act and proceed to fight it out in Federal court on constitutional grounds.

Of course, there is a final move that one can take to regain the freedom of space: go to another country and renounce US citizenship. If and when you find a country with fewer regulations on private individuals and more personal freedom than the US, let me know. As a science fiction writer, I had to *invent* a country in order to write a novel about this sort of thing.

I rather doubt that DOT will be able to write *and* enforce truly restrictive regulations regarding private launch vehicles and payloads. They will have to temper the authoritarian power delegated to them by the Act. The reason is very simple:

The Commercial Space Act of 1984 is written so broadly, with such vague definitions that a zealous bureaucrat could interpret the provisions of the Act to cover something as innocuous, commonplace, and obviously ridiculous as a two-ounce Park water rocket filled with air-pressurized water, launched from any backyard, and capable of reaching an altitude of less than thirty feet.

Reason: the Act defines a "launch vehicle" as any vehicle constructed for the purpose of operating in, or placing a payload in, outer space *and any suborbital rocket*. (Emphasis added.) It defines a launch as "to place, or attempt to place, a launch vehicle and payload, if any, in a suborbital trajectory, in earth orbit in outer space, or otherwise in outer space." Where does "space" and "outer space" begin? None of the space lawyers will venture to suggest the lower limit of space. Why? "The Soviets have said that they'd object to it," two different space lawyers told me independently. Technically, a "suborbital trajectory" is any flight path of any object that leaves the surface of the Earth and proceeds to fly in a

free-ballistic path, finally returning to the surface of the Earth.

This means that DOT can, if it desires, require permits and licenses and all the safety and mission reviews for every model rocket launched in America. According to the National Association of Rocketry, this amounts to more than twenty million rocket flights from hundreds of thousands of schoolyards, football fields, and other open sites that qualify as "launch sites" under the definition of the Act. Model rocket manufacturers such as Estes Industries, Inc. and Aerotech, who are members of the Hobby Industry Association, are prepared to include a preprinted pad of applications for launch permits in every model rocket kit and package of model rocket motors sold in America.

For years, I've been told, "Be careful what you ask for; you'll get it." The Federal government had better beware of that possibility, too. However, look at the bright side of it: DOT would have to hire thousands of civil servants to process these twenty million permit requests, inspect each model rocket, and supervise each schoolyard launch. Lumberjacks will have to cut down thousands of trees which papermakers will convert into paper. Rubber stamp manufacturers will enjoy a booming increase in business.

This is what Washington calls "creating jobs" and "invigorating the economy."

But it also keeps us out of space.

Time to start fighting for freedom of space.

However, it just might be too late.

EDITOR'S INTRODUCTION TO:

THE SPACE BEAT

Lead times for a paperback magazine make those of regular magazines seem swift. We were therefore able to slot the first follow-up article to "Escape from Planet Earth" as an afterword to that very article. And here it is.

—JPB

THE SPACE BEAT:

WAITING FOR THE OTHER SHOE TO DROP

G. Harry Stine

"Stine, what you've done hasn't helped free enterprise in space; it's driven potential investors away!"

That's what I heard during a telephone call from an individual in the U.S. Department of Transportation's Office of Commercial Space Transportation shortly after my article, "Closing the Door to Commercial Space Development," appeared in various regional issues of *The Wall Street Journal* during July 1985.

The WSJ piece was a short, concise version ("Twelve hundred words, please; for the Pope, we might go fifteen hundred words.") of my article, "Escape from Planet Earth," which appears here. I pointed out that the proposed regulatory policies of the Office of Commercial Space Transportation (OCST) of the Department of Transportation published in the February 25, 1985 issue of *The Federal Register* effectively would do nothing more than close the door to private space development. Essentially, according to the originally-announced policies, nothing would be given

a launch permit without intensive OCST inspection and involvement because of the government liability set forth in various UN space treaties.

I will say this: The WSJ article certainly rattled various cages and shook the bushes in Washington and Houston. OCST got far more comment on their Notice of Proposed Rulemaking (NPRM) than they'd anticipated. (Sorry about all the acronyms, but if I didn't use them this column would take up much more space. I'll try to define each acronym the first time it's used.)

Two things happened as a result of the WSJ article.

First of all, I was assured by people at OCST during telephone conversations that the proposed policies were only "proposed." They had to get something out for public comment, I was told. (However, I feel certain that without some of the strong comments that came in, those "proposed" policies would have indeed become real.) At the time of this writing, the final policies and the OCST regulations for commercial space launch vehicles hadn't been published yet. I am told they were due to appear in *The Federal Register* in January 1986.

The Federal Register used to be a slim document in which various government agencies published NPRMs and final notices of adopted regulations. It comes out weekly. Over the years, the page count grew and grew. Today, the size of *The Federal Register* isn't determined by its page count, but by its weight. However, although it's possible that the new OCST regulations could slip past among the thousands of words in *The Federal Register*, it's unlikely because there are far too many people now waiting and watching for publication.

The second thing that my WSJ article did, I am told, was to shake up some people in Houston, Texas where many of the big space enterprise activities are centered. I was not given any names during my

telephone conversation with the OCST person, but it was reasonably obvious who he was talking about when he told me that the WSJ article had forced OCST chief Jennifer Dorn to fly to Houston and meet with various entrepreneurs and investors there. Her job: convince them that what I'd said in the WSJ referred only to the "proposed" OCST policies for regulatory action. However, it was obvious that what I'd reported here and in WSJ had brought some things to the attention of investors that they wouldn't normally have seen.

My reply to the OCST person was simple: The "proposed" OCST regulations would indeed have so severely restricted commercial activities in space that potential investors should have been concerned. If OCST, relying on NASA for technical help and advice, could deny a launch permit on the basis that the activity wasn't "in the best interests of the foreign policy or national security of the United States," this could be used to give a blanket down-check for anything that threatened to undercut the government-subsidized Space Shuttle launch costs.

"We're not in bed with NASA," the OCST man maintained.

Well, folks, all of this remains to be seen. We're waiting for the other shoe to drop. We'll see what the OCST regulations really are when they're published in *The Federal Register*. And we'll see how OCST really acts when someone like Pacific American Launch Services or Third Millennium, Inc. gets their private launch vehicles ready to fly in the next five years.

The possibility of interference from regulatory sources exists because it's now technically feasible to orbit payloads for far less than it costs to do it with the NASA space shuttle, which is a 1970 design. And when the technology is available, someone will put it to use if there's a market, providing that the technol-

ogy isn't stifled either by government regulation or failure of nerve on the part of the engineering profession.

We've already discussed the former. How about the latter?

The Space Forum of CompuServe Information Services, an online network, has had quite a bit of discussion about several proposed private launch vehicles. One of these is the Space Van designed by Leo Cormier of Third Millennium, Inc. (whose logo, MMI, is the Roman numeral for the year 2001 A.D., when the third millennium does indeed begin). Another is the Phoenix launch vehicle under development by Pacific American Launch Services. Space Van is a mini-shuttle launched from atop a Boeing 747. Phoenix is a vertical takeoff, vertical landing (VTOVL) space craft that looks very much like a larger version of a Gemini or Apollo space capsule. Some space engineers on the forum net don't believe either Space Van or Phoenix will work, or that they can be built for less than a couple of billion dollars. Well, we're going to be given the opportunity to see whether or not that's a correct assessment.

Back in August 1985, NASA Administrator James Beggs turned down a proposal from Society Expeditions, Inc. of Seattle, Washington to use the Space Shuttle for space tourism. Society Expeditions was willing to build a 75-passenger module to fit in the Orbiter payload bay. Beggs said no. So Society Expeditions signed an agreement with Pacific American for exclusive charter flights to low-Earth orbit using the Phoenix-E reusable launch vehicle. Pacific American will have the responsibility for the design, financing, manufacturing, and testing of the Phoenix-E and will then operate two Phoenix-E vehicles for Society Expeditions for a five-year period. Estimated cost for a ticket to space: $50,000 (in contrast to about $1 million to get on the NASA space shuttle, if

you can prove to NASA that you need to be in space or you're a politician). This agreement is worth at least $280 million to Pacific American, making it the largest private commercial space sale yet made and the first sale of a launch service to carry passengers on an orbital flight.

The Phoenix-E design will carry up to 20 passengers and a crew of four. Pacific American states it will have the first Phoenix-E flying in 42 months or less with charter service beginning in about 1991.

Details on the Phoenix-E may be obtained by sending $2.00 for copying and postage to Commercial Space Report, P.O. Box 60547, Sunnyvale, Calif. 94088. Information on space tours should be directed to Space Voyage Coordinator, Society Expeditions, Inc., 723 Broadway East, Seattle, Wash. 98101, telephone (206) 324–9400.

If this really works out, I suspect that the flights will be booked solid well in advance.

And if Phoenix-E becomes available with a lift cost of $300 per pound to low-Earth orbit, this opens up all sort of possibilities for space commercialization for one simple and overriding reason: The biggest barrier to space commercialization has been and is high lift cost. As I have been pointing out to various enthusiastic people who want to become space entrepreneurs and are brimming over with ideas and concepts for things to be made in space, nothing except a few federally funded or subsidized projects (which automatically means "government approved" projects) will ever get the chance, because the Space Shuttle is the only game in town right now. Space commercialization demands private space launch vehicles with reduced operational costs that haven't been covered with NASA gold-plate and tested until they're nearly worn out.

However, there are some big "ifs" connected with Phoenix-E or Space Van or any of the other private

space vehicle concepts. It doesn't rest with technology; the technology is there. It rests with finance: getting the money and keeping the money coming until until the beast is *made* to work and begins turning a profit.

In this regard, the private space vehicle industry is very much like another very sporty game, the jet airliner industry. Boeing risked $16 million, more than its net worth at the time, to develop the 707. They had to have a flying example before airlines would even look their way, much less send senior pilots to try their hands at the controls. Even though Pan Am and United each ordered twenty 707s in 1955 (they didn't go into operation until 1958), Boeing's big risk was initially covered only by the fact that in 1954 the United States Air Force bought 29 versions of the 707 that Boeing called the Model 717 and the USAF called the KC-135.

Pacific American is going to have to develop the sort of marketing expertise that saved Boeing; they're going to have to sell some Phoenix derivatives either to the USAF (who really doesn't like to share the Space Shuttle with NASA) or to other outfits who want to get into space. Even at a few hundred million a copy, the Phoenix isn't that much more expensive than a Boeing 747–300 or a Lockheed C–5A. And twenty-five years ago, who would have thought it possible to sell a jet airliner for more than $50 million? The 707 was going for about $6 million then, and that was expensive. But guess what you have to pay for a little Learjet today? Would you believe a price tag of about $70,000 for an equipped little Cessna 172 Skyhawk that sold for less than $20,000 ten years ago?

Therefore, in spite of the continual possibility of government regulation and the fact that most financial people have a strong tendency to sell short when it comes to space enterprise, we're getting there slowly but surely. The Beat Goes On.

EDITOR'S INTRODUCTION TO:

RANKS OF BRONZE

Warning: This story does not have an ending, and its publication is intended to instill in you an absolute compulsion to seek out and purchase the novel from which it is excerpted. YOU HAVE BEEN WARNED. Don't get us wrong, though: it's pay-copy, and we think you will enjoy it a lot.

"Ranks" had its beginning in a story I published back in my *Galaxy* days about a Roman legion broken in battle and sold into slavery. Turns out it was alien slave traders (using human intermediaries) who did the buying. The humans in on the caper thought they were dealing with devils, which in a sense they were; slave-trading mercantilists belong in the same cirlce of hell occupied by Marxists.

Because *Far Frontiers*' schedule has slipped a bit, publication of this issue is simultaneous with publication of the novel of the same name (Baen Books), so you don't have to wait a minute to find out what is going to happen to Crassus's lost legion.

—JPB

Ranks of Bronze

David Drake

Gaius Vibulenus wore a white horsehair crest to mark him as a tribune. Fear turned the dew dribbling from that insignia into drops of acid on the back of his neck. Dawn was beginning to raise a bitter-flavored mist from the valley before them, and the occasional serpentine trees seemed to writhe as they bathed in the thick air.

The enemy was deploying from its camp in the shelter of great basalt pyramids which the sun revealed as a natural rock formation, not the godlike city which the young tribune had thought he saw against the night sky.

"Mother Vesta," Vibulenus whispered as his fingers tightened on the bone hilt of the sword sheathed at his left side, "let me live to see my hearth again. Father Hercules, give me strength to endure this time of testing."

A signal began to boom from the enemy camp. It sounded like thunder, a crash which built into a

rumble and did not slacken though the whole valley began to echo with it.

"Mother Vesta," the tribune repeated, "let me live to see my hearth."

". . . ten feet tall," a legionary was muttering to his fellow as the Tenth Cohort stumbled towards its position on the left flank. "And they eat their enemies *raw*."

"No talking in ranks!" snarled a non-commissioned officer—Gnaeus Clodius Afer, the file-closer who ranked second of the eighty-odd men in the cohort's Third Century. In barracks, Clodius would have carried a swagger stick, but here in the field he bore two javelins and a shield like any other line soldier. He rang the butt of the lighter javelin on the bronze helmet of the man who had spoken.

The legionary yelped and stumbled. Dim light and the helmet's broad cheek pieces concealed the man's face, but the tribune recognized the voice as that of Publius Pompilius Rufus—one of the few legionaries he actually knew. Rufus and his first cousin, Publius Pompilius Niger, came from farms adjoining that of Vibulenus' own family, and the three boys had attended school together in Suessula.

"Here, fellow," Vibulenus said in a squeak that was meant to be a growl of warning to the non-com. He put his arm around Rufus' shoulders and glared back at Clodius. "No need for brutality."

"Sir, that's all *right*," the legionary whispered hastily, jumping sideways and hunching as if the tribune's arm were afire. Rufus collided with the trooper to whom he had been speaking—his cousin Niger, of course—in a clash of equipment much louder than that of the non-com's blow a moment before.

"No need for little pricks too young to shave, neither," Clodius muttered, enough under his breath that Vibulenus could pretend the words were lost in the artificial thunder from across the valley.

Vibulenus stepped back, rubbing the lip of his

Greek-style helmet, more of an ornate bronze cap than functional protection like those of the line soldiers. With his hand raised that way, his forearm concealed the face which he was sure glowed with his embarrassment.

Anyway, it wasn't true. He *had* shaved, and that first beard had been dedicated in a golden casket in the temple of Juno of Suessula which his father had refurbished for the occasion.

And would that the gods had struck him down in that moment. Then his family could mourn the ashes of Gaius Vibulenus Caper, and he himself would be spared all this.

Whatever *this* was.

How could General Crassus have bungled so badly at the end of a brilliant career?

Because of the noise around him, and even more because of the turgid echoes of his thoughts, Vibulenus did not hear the sound of the horse approaching until a legionary's curse was answered with, "Watch yourself, dog!" in the nasal bray of the rider, Rectinus Falco—another of the legion's six tribunes.

Falco was the last person Gaius Vibulenus wanted to see right now, but even that had its advantages: Vibulenus' shoulders straightened, his face became a mask of cool disinterest; instead of roiling with fear and embarrassment, his mind focused on the fact that he did not have a horse and that bastard Falco did because of the way he had made up to the Commander.

"Our commander sends me to check on the progress of the left wing," Falco said. His accent implied that he was born and bred in a townhouse in the wealthiest section of Rome. In fact, he was country gentry from Campania, just like Vibulenus himself; and the Vibuleni could have bought Falco's family three times over.

Not that questions of birth affected where the two

tribunes stood, right now and for the foreseeable future.

"Not the level of progress one might have expected," the horseman went on, raising himself a trifle in the saddle by pressing his hands against the double front pommels.

"Tell the Commander that he needn't concern himself with this flank," Vibulenus replied in a tone of vibrant haughtiness that surprised him and would have surprised his declamation instructor in Capua even more. He had never shown signs of oratorical power. This was a hell of a place for it to turn out that he had talents in that direction after all. "Though I would have expected more cavalry to support us."

In all truth, this was a Hell of a place.

"Vibulenus, you'll go further if you learn to tend to your *own* affairs," Falco snapped angrily. He raised his torso higher with his hands and clamped his knees near the top of the saddle to peer at the cohort from a slightly better perspective. No doubt about it, the man was a natural horseman. "Which," he went on in his nasal sneer, "you seem to be doing a very bad job of, as ragged as these lines look."

"Then if you'll get yourself and your animal out of the deployment area," Vibulenus responded with ringing clarity, "we'll proceed with our business."

Falco might have continued the wrangle—which was not about war but rather status, and therefore of much greater importance to him. One of the line soldiers (was it Clodius Afer again, watching the ranks quick-step past?) muttered, "Wonder how he'll ride with a spear up his bum?"

The horseman dropped back into a full seat with an alacrity that proved he considered the threat from the ranks more than rhetorical. The sun had risen high enough to clearly limn the anger on Falco's face as he tugged at the bridle and spurred his mount's right flank to twist it into a tight pivot. He continued

to kick the horse as he rode back toward the command group at a twitchy canter.

Vibulenus drew a deep breath, obscurely thankful to Falco. Nothing like anger to drive out . . . weaker emotions. And he'd been worse places, they all had—trapped without water and without shade, facing Parthian arrows that could punch through shield and breastplate alike if a man's luck were out. Abandoned by their allies, abandoned by Rome, and utterly abandoned by hope.

Though it was doubtful that any of the three elements were closer to them now than they had been that terrible day in Mesopotamia.

The tribune had a better view of the enemy across the valley than he did of his own men; but the enemy was not his job, not yet, and he determinedly concentrated on the deployment of the legion's left flank.

The legion had only a hundred and fifty attached cavalry at the moment, and horses were in even shorter supply than trained riders. There was a tiny squadron of blue-plumed helmets bobbing in the sunlight ahead of the deploying infantry. Weeks before, or what seemed like only weeks, Gaius Vibulenus would have been too ignorant to be bothered by the lack of cavalry. Nobody who had survived the disastrous advance from Carrhae could ever again be complacent about unsupported infantry. The tribune froze as his mind flashed a memory of Parthians riding out of the dust, the sun glinting like lightning on the steel heads of their arrows. . . .

A trumpet blew three short blasts, answered almost immediately by three thinner, piercing notes from a curved horn. The sound recalled Vibulenus to a present which, bad as it might be, was better than that past in Mesopotamia. The right-hand pair of the cohort's six centuries had reached their proper spacing, and their centurions had signalled a halt.

Like a bullwhip, the tip continued to move for some moments after portions further back had stopped. Vibulenus heard the centurion of the Fourth Century give an order to his trumpeter, followed at once by a two-note call and shortly later by the whine from the Third Century's horn. The legionaries closest to the tribune, three ranks ahead of him and as many behind, clanked and rattled to a halt.

Without a horse, the young tribune couldn't see a thing, not a *damned* thing, of the legion except the mail-armored torsos of the nearest soldiers. He strode between files, the alignment perpendicular to the legion's front, pausing as each man of the century dressed ranks by rotating one of his javelins sideways and horizontal. "Hey!" snarled a trooper whom Vibulenus jostled with his round shield in brushing past, but the man recognized him as an officer and blurted an apology even as the tribune stepped beyond the ranks and became, for a moment, the Roman closest to the enemy.

"Sir?" said someone in a concerned voice.

Vibulenus turned and saw, to his surprise, that Clodius Afer had spoken. They were all nervous. Perhaps the file-closer was as embarrassed at clubbing a man with his spear as the tribune was at butting into cohort discipline for purely personal reasons.

"It's all right," Vibulenus explained. "I'm—" To his amazement, he then said what he suddenly realized: "I'm less afraid out here. I think it's because—the arrows you know? We were all packed together, and the arrows kept falling. So in ranks I, I expect the arrows."

Clodius blinked in total non-comprehension. Several of the front-rank legionaries looked at one another with expressions which were too clear to permit doubt as to what they were thinking.

"Carry on," the tribune said sharply, flushed again

with anger at everything but himself and the tongue that kept blurting things it should not. "I'm attending to the dress of this flank."

Well, that was the conscious reason he'd had for stepping out of ranks.

The legion was in fully-extended order, all sixty centuries in line with nothing held back for support or reserve. That gave them a frontage of almost a mile, a considerable advantage in keeping the enemy from swarming around both flanks—but it provided no margin for error, either on the flanks or in case an attack penetrated the thin six ranks into which the troops were stretched.

Perhaps the new commander knew what he was doing. Marcus Crassus had not. That was a certainty to the gods and to everyone who had served under that hapless general in Mesopotamia.

For all that, the ranks of bronze and iron and leather-faced wood had a look of terrible power. They made Vibulenus shiver with joy that he was on this side of the valley and not the other where the enemy fell to with the disorder of grubs spilled from rotting wood.

The ranks twisted like serpents crawling, for the slope across which the legion deployed was too irregular to accept the straight lines of the parade ground. These even curves had the sinuous power of a living thing, however, and within them the five-foot spacing between individual troopers looked flawless to Vibulenus despite the searing curses of non-coms who felt it could be improved. The First and Second Centuries locked into alignment with a final shudder, trumpet calling to horn. The sun behind threw the legion's long, spiky shadow across the grass toward the enemy.

A legionary—he should have been mounted—jogged across the front. He was coming from the pilus prior, the cohort's senior centurion. "Ready as

ordered, sir," the man muttered as he passed Vibulenus, but he was on his way to the Commander waiting among his terrible bodyguards behind the center of the legion.

The tribune nodded and tugged at one end of his sash, a token of rank like his trailing horsehair crest. Empty rank. *He* didn't command anything. It required a minimum of ten years' bloody service to become senior centurion of a cohort, and at least that—plus family and connections—to become the legate in charge of a legion.

When his newly-formed legion had marched away from Capua with its standards sparkling, the horns and trumpets calling triumphantly, Vibulenus had believed that he was part of Rome's splendid conquest of barbarians. Mesopotamia and the gilded armor of the Parthian cataphract horsemen had cured him of that mental posturing; and disaster had left nothing behind but his youth, and the empty "oversight" of the left flank which his breeding gained him.

He could probably manage to die heroically, but it was clear that the new commander would care even less about such a death than Crassus would have.

Three cavalrymen trotted from the left flank, their shields slung and their reins spread wide in both hands against the chance of horses slipping and throwing them down between the lines. Vibulenus stamped his right boot to test the footing himself. The hobnails grated a little, but the grass rooted the surface into sod and there was no evidence of shingle to make a horse or armored soldier skid.

But the riders were scouts, not fighters, and they were understandably skittish about the potential problems which they were sent to search out. In battle mode, these men would gallop across the same terrain with shrieking abandon, each of them trying to be the first to come to grips with the enemy. They

and their fellows had done just that under the leadership of Crassus' son, disappearing in pursuit of Parthian horsemen who fled until the Roman squadrons were out of touch and support of the infantry.

It was so *easy* to blame others for the fact that Gaius Vibulenus Caper was here. And it did so little good.

There was a series of horn and trumpet signals from the right flank, distorted by distance and possibly multiplied by echoes. The thunder from the hostile encampment continued, but it was supplemented by deep-throated shouting.

A pair of vehicles drove from the mass of the enemy. With two axles apiece and a flat bed laden with warriors, the vehicles looked like wagons, but their drivers lashed them on like racing chariots. They were drawn by teams of six beasts which looked more like rangy oxen than like anything else in Vibulenus' experience, two pair pulling in yokes, and a beast attached only by hames to either side of the yoked leaders. They made for the scouting horsemen with the singleminded determination of gadflies seeking blood.

Mingled horns and trumpets from the command group called the advance. The signallers of the individual centuries picked up the concentus, until the massed call had spread past Vibulenus to the horn of the cohort's First Century.

"Cohort—" called the senior centurion, his voice audible because he had raised it more than an octave to pierce the bleating signals.

"Century—" the other centurions echoed with greater or lesser audibility, depending on their experience with getting real power behind a shout that was above their normal range.

"Advance!"

Raggedly, because some men did not hear the command and responded to their comrades' motion,

the legion began to stride forward. Most of the men gave a shout, and a few clashed the javelin in their right hand against their shield boss.

The three horsemen were cantering back to their fellows, the task of scouting the intermediate ground accomplished by the enemy. The war cars bounded over irregularities, hurling the half-dozen warriors in the back of each into contortions as they clung to ropes looped around frame members. The vehicles lurched awkwardly where the opposing slopes met at the valley bottom, but there was no gully there and not enough of a bog or watercourse to affect the advance of the legion.

A warrior in the back of either cart was banging a mallet against a sheet of bronze slung from a pole. The rumble of changing harmonics explained the greater thunder emanating from the enemy camp.

"Ware!" called Clodius, and the tribune skipped aside as the legion rejoined him at the rate of two paces per second.

There was a slight gap in the frontage between the Third and Fourth Centuries—inevitable because the units dressed ranks within themselves, and useful because it provided a narrow aisle in which the noncoms could scurry between the six ranks for which they were responsible. Vibulenus fell into step between the Third Century file-closer and the centurion of the Fourth, a dull-faced veteran named Vacula whom the tribune had never heard speak a word which was not an order or the response to an order.

"How many do you think there are?" Clodius asked. "Sir?"

Vibulenus was trying to position his round shield. It was lighter and easier to carry than the big oval scutum of the line troops, but a similar piece of equipment had seemed horribly inadequate against the sleet of Parthian arrows. Startled by the question but openly delighted that someone was treating

him as if he had some purpose, he squinted across the valley at the army toward which they strode.

It was like trying to guess how many roses bloomed in the fields beneath Vesuvius, and an honest guess would have been in horrifying contrast to the five thousand, more or less, legionaries bearing down on those opponents.

So instead of blurting, "Thirty thousand, maybe as many as fifty"—the figures that clicked through his mind—the tribune said, "They look like they're all naked, and only the ones in the chariots have shields."

They also looked like they were ten feet tall, just like Rufus had said. Well, maybe eight feet tall.

"Yeah, well. . . ." said the file-closer. "At any rate, they aren't shootin' arrows over their backs as they ride away, this lot."

With no more organization than water bursting a dam, and with the suggestion of equally overwhelming force, hundreds of additional war cars charged from the enemy line without appreciably diminishing the mass that remained. The rumble of flexible bronze as they approached had an omnipresence that horns or even proper drums could not have equalled. It was as if the legion were approaching a swarm of bees, each the size of an ox.

The warriors were shouting as their vehicles galloped onward, but their cries were surprisingly high-pitched for all the breadth of their torsos. Plumes of single feathers or perhaps blue-dyed plant fibers trembled stiffly from the sides of each warrior's helmet.

The naked mass of infantry which remained on the hillslope seemed, when Vibulenus squinted, to be armed with clubs or maces. The warriors in the cars each carried a long spear tipped with the black glint of iron. Some of those who clung to their vehicles with their spear hand brandished huge shields, allowing glimpses of breastplates and swords or daggers in belt sheaths.

"The chariots that came first," Vibulenus shouted. He was in effect a rank of his own, a stride behind the leading legionaries and a stride ahead of the second rank, but he was marching in time with the centuries to either side. The strap of his shield was already beginning to chafe the skin of his left forearm, and the unfamiliar effort of holding the piece of equipment advanced was causing his biceps muscles to cramp. "What happened to them?"

Clodius Afer twisted his head enough to look past the cheek-pieces of his helmet at the tribune. He grimaced, a facial shrug because those were the only muscles not bound by armor or clutching equipment. "Not our problem," he shouted back; and he, like Vibulenus, hoped that was true.

The trees grew more thickly on the lower slopes of the valley. One of them forced the tribune to dodge aside to pass it between him and Clodius. Close up, the tree had even more of a snaky unreality than it and its fellows displayed at a distance in the mist that had already burned away. The bark was segmented into pentagonal scales, and the trunk, nowhere thicker than a man's thigh, terminated without branches in a single fleshy nodule thirty feet above the ground.

Vibulenus brushed the trunk with his left shoulder and wished he had not. His shield rim and the fabric of his tunic sleeve glistened with a thick fluid scraped from the bark. It felt slimy where it soaked through to his skin.

"Ready!" called the file closer, facing the men to his left.

Simultaneously, the centurion of the Fourth Century roared toward the mass of his own unit, "Century—"

The nearest war cars had rolled across the center of the shallow valley and were now climbing toward the legion. The draft animals looked distinctly unlike oxen now that the tribune had a closer view. They had four gnarly horns apiece, one pair in the usual

place atop the head and the other on the nose. Vibulenus had not heard of anything like them, even among monstrous births catalogued with omens.

There were so many of the cars that they were jostling for position as they neared the legion. The unyoked draft animals fouled their opposite numbers in neighboring teams, and one vehicle upset because its driver did not have enough room to maneuver around a tree.

"Charge!" shouted Clodius Afer, a fraction of a second before Vacula shrieked the same command in a carrying falsetto. Both non-coms and their fellows from the opposite flanks of each century in the line began to run toward the chariots only two hundred feet away.

For a moment, the centurions and file-closers were alone, a ragged scattering ahead of the legion like froth whipped from the tops of waves. Then the whole legion broke into a run as the right arms of the two leading ranks cocked back, preparing to hurl the lighter of the pair of javelins each legionary carried.

Gaius Vibulenus began to run also and tried to draw his sword for want of a javelin to throw. He had to catch up with the centurions because he was an officer and if he could do nothing else, he could set an example . . . but it wasn't that simple, except in the part of his mind which refused to think and which was in control now.

Because he was young and fit, for all his relative inexperience with the weight of his armor, Vibulenus was beside Clodius Afer again when the file-closer's arm shot forward and sent his javelin off in a high arc toward the enemy. Clodius' heavy shield swung back around the pivot of his firmly-planted left foot, balancing the heave of the missile.

The advancing line stuttered as each man lost a step when he launched his javelin. The tribune, who had finally gripped his flopping sword sheath with

his left hand so that he could draw the weapon with his right, found himself once again in front of the remainder of the legion.

The war cars were drawing up, apparently according to plan rather than in reaction to the legion's advance. Drivers swung their teams to one side or the other in a scene of utter confusion, but with fewer real collisions than the dense array had suggested would result. The enemy were, after all, practiced at their method of warfare even if they made no attempt at discipline in the Roman sense. The warriors were springing from the vehicles even as drivers sawed back on their reins as if to lift the teams' forehooves off the ground.

Some fifteen hundred javelins rained down onto them in a space of less than two seconds.

"Rome!" cried Gaius Vibulenus, while the legionaries behind him were shouting that and a thousand other things as they ran toward the foe.

The warriors' shields were big, even by comparison with the bodies they had to cover, and they were solid enough that even hard-flung javelins penetrated only to the barbs of their heads. The teams had been in confusion before the missiles gouged many animals into rearing agony. Now they were in chaos. Several teams raced off in whatever direction they were pointing, spilling their drivers and occasionally dragging an overturned car like a device for field-levelling.

Most of the warriors were unharmed, though a few had been caught as they jumped from their vehicles and now sprawled or staggered. Their chest armor, even when studded with metal, did not turn or stop the missiles the way the heavy shields had done. The weight of the javelins stuck in the shield facings, half a dozen in some cases, was an awkward additional burden. Many of the warriors were trying to tug the

javelins clear when the second flight, from the third and fourth ranks of the legion, hit them.

Vibulenus was running downhill, though the slope was no more than an inch in twelve. When a Roman javelin sailed over his shoulder, missing the back of his neck by no more than the blade's width, his bloodthirsty joy and feeling of invulnerability washed away in a douche of fear. The young tribune tried to stop. His hobnails skidded out from under him, and the long spear the warrior thrust at him gouged a fleck of bronze from Vibulenus' helmet instead of plunging in through his mouth and out the base of his skull.

The spearpoint's ragged edge was the result of forging at too low a temperature rather than deliberate serration, but the difference to Vibulenus would have been less than academic had the blade sawn a hand's-breadth slot through his face. As it was, the tribune's shin hurt more where his shield banged it than his head did from what would have been a deadly thrust.

The warrior who was trying to kill him had two feathery plumes that were part of his head rather than clothing as Vibulenus had assumed from a distance. He was lifting his spear again to finish the job with a second overarm thrust.

In panic that froze the events around him down to gelid detail but did not make them more soluble, Vibulenus swatted at the spear as he would have tried to bat away a spider which was leaping toward his eyes. The sword he held forgotten in his right hand clashed against the warrior's weapon. The iron spearhead shattered, victim of the best blade of Bilbao steel which Vibulenus' father could find for his boy to carry to war.

Something drained from the tribune at the shock—fear of weakness or concern for anything save doing the

best job that could be done with the business Fate had handed him. He started to get to his feet.

Clodius Afer thrust his remaining javelin into the center of the warrior's chest until a foot of the point and metal shaft stood out through the back of the fellow's ribs.

"Eat *that,* pig-fucker!" screamed the file-closer as he released the javelin shaft and tried to draw the sword sheathed on his right side. Vibulenus jumped forward, his shield in front of his body as much by chance as skill, and blocked away the spear with which another warrior was stabbing for Clodius' life.

Close up, the warriors were half again as tall as the five-foot-eight-inch tribune, and their blue feather plumes waved a foot or so still higher. They gave off a smell like something chitinous and dead.

Vibulenus cut at the warrior whose spear he had just brushed aside. It was his first conscious attempt to use his sword, and he was clumsily ineffective: the blade chopped into the framing which supported the multiple layers of hide, scarcely making the heavy shield quiver. As the warrior tried to recover his spear, Clodius ducked under the shaft and hacked at the fellow's leading ankle with the skull of a butcher jointing a rabbit.

The warriors had howled as they came on, but when they were wounded they did not scream with pain. This one twisted silently, trying to brace himself with his spear and the shield whose lower rim he had slammed against the ground an instant too late to protect himself.

You're either lucky or you're not. You know that you *are* lucky from the fact that it's the other guy sneezing blood and bits of lung tissue onto the spear in his chest.

"He's got it!" Vibulenus shouted, as if he were a spectator at the arena instead of a participant in a full-scale battle. He was premature as well, because

the warrior did manage to hold himself upright. The tribune tried a finishing blow at the feathered skull and only notched the shield rim again. Then Clodius put nine inches of steel in under the warrior's right arm and jumped back in time to keep from being struck by the toppling shield.

There were no warriors still standing within a spearlength of the Roman line. A pair of the enemy tried to scramble into action past an overturned war car. A dozen thrown javelins cut them down like wheat before the scythe.

"Come on, boys, we got 'em!" the file-closer cried as he jumped onto the vehicle himself.

"Come on!" Vibulenus echoed as he followed the non-com. He was not really aware of the rest of the legion, much less trying to encourage the men behind him. His conscious mind was shouting to the instinct that was ruling his actions, unnecessary except that it was the only thing his intellectual portion could do at the moment.

The overturned vehicle was floored with rope matting stretched on a dovetailed wooden frame. While the mat supported and even cushioned the broad, bare feet of the warriors, it was woven too loosely to provide safe footing for a booted Roman. Clodius Afer's left foot plunged through an interstice which snared his knee like that of a hapless rabbit.

The file-closer cursed and stabbed at the matting, handicapped by his own shield. His point, bright already with warriors' blood, glanced from the tough fibers of the mat and gouged his calf. He raised his sword again.

Vibulenus hopped to an angle of the frame so that his feet were splayed outward but had firm support. The quality of the woodwork would not have disgraced a senator's bed. "Wait!" shouted the young tribune without realizing that he had just given the veteran non-com an order on the battlefield and that

he instinctively expected to be obeyed. Clodius looked up in surprise—and he did not for the moment strike again at the ropes trapping him.

Hundreds of additional war cars had drawn up short of the wreckage of the first wave, delivering more warriors to the battlefield. The giant spearman came on in clots, four or five together as they jumped from their vehicles. They made no attempt to form a shield wall, nor did the mass of naked infantry advance from the position it had taken at dawn just below their encampment.

Individually, the warriors were as skilled and strong as they were deadly. A quartet of them, leaping from a car whose driver immediately lashed it toward the rear again, saw Vibulenus and the trapped file-closer. Raising their shields and their fifteen-foot spears, the warriors advanced at a lumbering trot.

The tribune shrugged his left arm from the straps and let his shield drop to the matting. The muscles of his belly drew up as his body tried to twist itself out of the way of the spears it imagined already criss-crossing his flesh. He gripped Clodius under the right armpit and dropped his sword also in order to lock the fingers of both hands.

"Pull!" Vibulenus shouted, though what the file-closer really needed to do was to push down with his shield and right foot while the young tribune himself pulled.

Vacula and two of the legionaries from his Fourth Century ran to meet the oncoming warriors. The centurion flung his heavy javelin so fiercely that the nearest of the enemy staggered back, his shoulder pinned to the shield through whose triple thickness of hide the javelin had penetrated.

One of Vacula's men interposed his shield between a spear and the centurion momentarily, but another warrior took the legionary out of the fight with a thrust through the mail shirt and belly. The

non-com was still off balance from his throw and more intent on drawing his sword than on swinging his shield into a posture of defense. One long spear tore through the apron of bronze-studded leather meant to protect the centurion's thighs. While Vacula thrashed like an eel on a fisherman's trident, another warrior thrust through the bridge of his nose.

The surviving legionary slipped aside, his javelin poised as a threat to keep the warriors away from him now that they had finished with his fellows.

Clodius Afer's leg came free. Almost as part of the same motion, he vaulted down from the vehicle to stand between Vibulenus and the warriors advancing with bloody spears. "Watch it, sir!" called the file-closer. "Watch it!"

The tribune picked up his shield by the center strap, acting in too much haste to thread his forearm properly through the loop and then grip the real handhold at the rim.

One of the warriors stabbed at Clodius, but the veteran responded by shifting a handsbreadth to block the point with the thick, keel-like boss of his shield.

Vibulenus' sword stood pommel-up and ready to his hand, caught by the same matting which had held Clodius' foot. He drew it as he jumped down and almost lost the weapon again. The rope fibers snagged the notch left in the blade when it met the spearhead. A warrior thrust at him, and only Clodius' quick sideways chop with his sword stopped the spear from taking Vibulenus through the chest.

"Watch it, puppy!" the non-com screamed, barely able to block a thrust from his own left side.

The Pompilius cousins, Rufus and Niger, launched their heavy javelins as they scrambled over the wrack of vehicles and dead or dying animals. Neither missile was artfully aimed, but one wobbled into the throat of a warrior concentrating on another attempt at Clodius.

The wounded spearman bleated and staggered into one of his fellows. The third warrior, disconcerted, backed a step to take stock of the situation. Gaius Vibulenus, to whom everything since the attack had begun was a white blur, saw an opportunity with the clarity of the moon in a starry sky. He ducked low and swung the bronze-bound edge of his shield onto the bare instep of the warrior who was backing away. The way the small bones crunched made hair raise on the tribune's own neck.

"Come on, boys!" the file-closer shouted with his feet planted and his shield raised. The Pompilii and three of their comrades swept down from one side, and the survivor of the legionaries who had accompanied Vacula circled the hostile spearmen from the other.

The warrior whom Vibulenus had disabled bludgeoned the tribune with his spear shaft. Vibulenus' helmet had been knocked off at the start of the action, but he had not noticed it was missing. The spear was too awkward to be a good club, but the warrior made up with strength and the shaft's weight for any lack of quickness.

Vibulenus sprawled on his back with his eyes and mouth wide open. The sky was a pale orange, a complement to the color it had been a moment before, and against it the young Roman had a double vision of the spearhead which the warrior had poised to finish the job he had started with the shaft. The weapon disappeared in a blur of armored skirts and the blocky, powerful thighs of Clodius Afer, lunging between Vibulenus and death.

The tribune thought he was getting to his feet again only seconds later, but all the warriors he had been facing were dead on the ground and no Roman he recognized was anywhere around. The sixth rank of legionaires had already marched by, disordered somewhat by the debris on the field but not by

fighting. Each of the men held one javelin in the right hand and the other, heavier, missile gripped against the shield back.

Beyond them, already starting up the slope toward the enemy camp, were the leaders of the Roman advance. Among them Vibulenus could see the standard of the Third Century and the stocky form of Clodius Afer who was looking back over his shoulder to shout encouragement.

The tribune's vision was clear again. If it had not been. . . .

All of Vibulenus' muscles seemed to work, but when he moved he had the feeling that his body had become a water-filled bladder and that there were no bones within his skin. The only war cars he could see were disabled ones and the few racing, empty but for their drivers, toward the shelter of the massed infantry.

Annihilation of the armored spearmen had scarcely changed the balance of numbers. Tens of thousands of the enemy remained; and Vacula, with pink brains leaking out of the hole which included both eyesockets, was only one reminder that the legion had suffered casualties as well.

The tribune picked up the sword he had dropped. The effort of bending and rising made the left side of his head throb as if he had just been clubbed there again. He retched, but there was nothing left for his stomach to heave up. When he wiped his mouth with the back of his hand, he remembered that he had vomited when he first tried to get to his feet. He had forgotten that. . . .

Horns and trumpets called from Vibulenus' right, and the young tribune turned toward the source of the sound. Well behind the last rank, the command group was picking its way through the wreckage—once living and otherwise—of battle.

There were two men on horseback, Falco and another of the tribunes. The rest of the command

group was mounted on beasts which bore far less resemblance to horses than the four-horned draft animals of the enemy did to oxen. They were carnivorous, beyond doubt; giant lions, perhaps, or even huger dogs. They wore coats of iron scales, like the horses of the richest Parthian cataphracts. The score of inhuman riders mounted on them, the Commander's bodyguard, were armored in jointed suits which must have weighed hundreds of pounds apiece.

Gaius Vibulenus had not known where his place was. He still was not sure, but he knew he did not belong here, behind the legion, with Falco and those who had bought the Roman prisoners from their Parthian captors.

The young tribune began to jog down the remainder of the slope, clutching his sword but leaving his shield behind with the bodies. Every time his foot hit the ground, it pumped his skull airily lighter so that the pain resonating inside it became diluted to heat and a mild pressure.

When he opened his mouth to cry, "Rome!" he found that his constricted throat would not pass even a croak. He tried to shout anyway as he staggered like a drunk or a madman, reaching the sixth rank as its legionaries dodged the more numerous trees at the low point of the valley.

There were sounds of further fighting ahead, but the upward slope blocked vision. The slight decline from the opposite side of the valley had given the rear ranks an almost theatrical view of the start of the battle.

Gaius Vibulenus was an inch or two taller than most of the line soldiers, because his family could afford to feed him well as a child. That was not enough of a height advantage to permit him to see over the helmets and crests, short black brushes for the legionaries and red transverse combs to mark the centurions. He struggled through the ranks, bump-

ing and once pushing aside the troops who were doing their best to keep their order: the only task they were called on to perform at this moment.

Ahead were the shouts of men and the clattering of weapons, brilliants of sound embroidered on the thunderous background still shuddering from the enemy camp. The young tribune thought of hogs stumbling through chutes toward the slaughterer's knife, fearful and unable to see anything but the gap toward which they plunged between high board walls.

But even if the victims knew their fate, they might run to it for the sake of certainty in a universe of spin and chaos; and for Vibulenus, there was nothing certain except that he wanted the identity of a man who was in the forefront of this battle rather than one who hung back when he had the opportunity to hang back.

As he dodged a legionary who was unconsciously swinging his sword back and forth in an arc which threatened everyone on his right side, Vibulenus slammed into another of the serpentine trees. Its top nodule waved, showering the tribune with gooey, sweet-smelling fluid. Vibulenus swung himself around the bole, unconcerned by the glue-like smear the bark left on his arm and breastplate and unaware that his hair was now gummy with effluvium from the tree as well as with his own blood.

The third and fourth ranks had closed up so that the legionaries stood almost shield to shield as they mopped up spearmen still living in the wake of the front ranks. There had been an attempt to open out again as the advance continued unimpeded, but there were still clots and gaps like the pattern made by frog eggs on a still pond.

The portion of Vibulenus' brain which was in control functioned like a racer's, not like that of a man in the midst of battle. It sent the young tribune through one of the gaps. Ahead of him he could see the

standards and the leading elements of the legion already coming to grips with the hostile infantry.

There was a shower of stubby javelins from the enemy lines. One of the missiles, weighted near the head with a lump of stone, hit Vibulenus in the middle of the chest. The bone point shattered against the molded bronze of his breastplate, but the shock threw him back a step and brought him to his senses. Then he took the remaining two paces forward to join Clodius Afer as the file-closer hacked through the ribs of an enemy.

The tribune had lost both his helmet and his shield, but the hostile infantry were just as naked as they looked from a distance. They were taller than the Romans, but they were by no means the size of the spearmen who had ridden to battle on the war cars. Some wore peaked leather caps and bandoliers which held half a dozen javelins like that which Vibulenus' breastplate had stopped; but none of those whom the tribune saw carried shields or wore any armor that would slow an edge of Spanish steel.

One of the enemy swung his stone-weighted javelin at Clodius like a mace. It glanced off the file-closer's neck guard, making the man stagger and his helmet ring. Vibulenus stabbed upward through the enemy's belly and watched its feathers flutter as the creature toppled backward and died.

Gaius Vibulenus Caper had just killed someone—not a man, he supposed; but it might have been. And all that it mattered to him at the moment was that his sword caught in something and he had to jerk very hard on the hilt to clear the weapon.

"Bastard," snarled Clodius, slashing at the dead foe who had struck him. His voice was hoarse, and he gasped out the epithet between huge breaths through his mouth and nose together. "Bastard!" and he waded forward over bodies still quivering and oozing fluids from their wounds.

"Rome," wheezed the tribune in what was meant to be a shout. He hacked down the enemy who had just stabbed his left arm.

Hostile infantry higher on the slope volleyed bone and flint-tipped javelins, but those in contact with the Roman lines attempted to use theirs as hand weapons. The points could deliver a nasty or even fatal gash, and their stone weights might have been heavy enough to crush an unprotected skull. Against Romans with shields and full armor, they were singularly ineffective.

For a minute or two, Vibulenus and the leading element of the legion cut at opponents as thickly packed as wheat in a field—and as defenseless. Then the rearmost ranks of legionaries launched the javelins most of them still carried, arching them well beyond the line of hand to hand combat. The enemy reacted like a glass tumbler struck by a paving stone.

Roman javelins had been reasonably effective against the warriors in the first stage of the battle, creating a confusion even when blocked by shields or body armor. On the naked infantry, anyone hit was a victim, and the enemy was packed so densely that most of the missiles punched through two or even three of them. More of the hostile infantry had probably died on Roman swords already, but the suddenness of this disaster in the heart of the mass blew the troops who saw it into panicked flight.

When the pressure of their fellows behind them ceased, the front line of the enemy gave up even the pretense of resisting the legion. Vibulenus fell to his knees when his sword slashed only air. The victim he had tried to decapitate fled backward before the stroke in a great rubbery bound, his feather plumes fluttering like miniature wings as he flung away his bandolier of missiles.

None of the enemy within fifty feet of the tribune were still standing when he got his own feet under

him again. The ground writhed with bodies trying to stuff bright-colored intestines back into sword-cuts or withdraw javelin heads which extended as far behind as the shaft did in front of the wound. Survivors of the hostile infantry were loping away in all directions, faster than even the handful of Roman cavalry on the wings could pursue after the slogging effort of battle.

Within and ahead of the fleeing infantry were the war cars, empty now save for the drivers who were as furiously bent on escape as any of their fellows in the infantry. The vehicles (those which the legion had not overrun at first contact) had been drawn up behind the infantry, awaiting the signal to retrieve the warriors whom they had carried to battle. Now, like birds from a blazing forest, they bolted away with nothing behind them save raging disaster.

The thunder from the enemy camp ceased. Legionaries from the right flank were climbing over the low earthen wall, unresisted by those within.

Vibulenus tried to stagger forward in pursuit of the enemy. Someone grabbed him by the left shoulder. When the tribune attempted to brush off the contact in single-minded concentration on his task, he found that he had a nasty wound in the left biceps which he could not remember receiving.

All the strength and determination drained out of the young tribune. He slipped into a sitting posture on the ground. The lower edge of his breastplate gouged him as he slumped, but at the moment he did not have the intellect to care or the energy to do anything about the discomfort.

"That's right, boy," said Clodius Afer, releasing Vibulenus' shoulder and sprawling down onto the ground himself now that he had stopped the younger man. "We've done our job—leave the rest to those as are fresh."

The file-closer took off his helmet and gestured

with it at the rear ranks of the legion streaming on in distant pursuit of the enemy. The legionaries would not catch many of their naked foes, but their pressure would keep the enemy from regrouping and launching an attack on men exhausted by victory. "You get so tired," Clodius went on musingly, "you run right up on a spear and you don't know you've done it. Got to know when to stop, boy." He began to massage the back of his neck. Vibulenus could see the skin there had been scraped when the hostile mace drove down the helmet edge.

The tribune looked at Clodius. The younger man's vision had, since he sat down, been an apathetic blur for want of brain capacity to process what he was seeing. Now the non-com's face sprang into sharp focus. The skin was flushed, and ghostly red and white outlines remained from the pressure of the helmet rim and cheek pieces during the battle.

Clodius' eyes were open. They held no expression, but the crow's feet at their corners belied the youthfulness suggested by the man's thick black hair.

The file-closer was breathing through his mouth, though the breaths were controlled and not the gasping spasms which thrust Vibulenus' ribs against the inside of his body armor. The non-com had the look of an ox in the traces, tired but stolid and immensely powerful.

The tribune remembered the way Clodius had struck Rufus as the legion deployed. He realized now that the veteran had known too well what the next hours would be like, and his knowledge had made him savagely intolerant of lapses in discipline.

Vibulenus glanced at his sword. Fresh, the blood on it had looked normal enough; but as the fluid dried, it took on a purplish sheen. His face stilled to hide his awareness that his right arm to the elbow was covered with the same inhuman fluid, Vibulenus began to wipe the flats of his weapon on the grass

and gritty soil. His left arm was too stiff to use, and when he tried to move it, the scab and exposed muscle crackled painfully.

"What's *that?*" demanded Clodius Afer in amazement, his fingers hesitating in the midst of releasing the laces that held the shoulder straps to the front of his mail shirt.

The tribune shifted his whole body to follow Clodius' gesture, finding as he did so that it was much more comfortable to be facing back down the slope anyway. Coming toward them was a device that resembled a piece of siege equipment. It was circular and turtle-humped, twenty feet in diameter and as high at the center as a man standing. The tortoise-like object was a saturated blue in color, and—though this might have been a trick of the angle—it appeared to move by drifting a foot or more above the ground.

"I don't know," Vibulenus admitted. He did not have enough emotion left to be concerned. "Maybe it's something like what they loaded us onto." And had later marched them out of, though neither he nor any member of the legion to whom he had talked could remember anything about the intervening period. "A boat."

He reached up to unfasten the studs of his cast-bronze body armor. Pain in his left arm brought the motion to a wincing halt.

The file-closer grimaced at the tortoise drifting over the bodies on the slope. Then, turning his attention to something within his experience and therefore not frightening to him, he said, "Here, let me bandage that," and took a folded strip of two-inch linen from the wallet he carried on the back of his equipment belt.

"Hold *still,*" Clodius added sharply as Vibulenus turned his head with a bland expression and an unstated desire not to look at the damage to his body. The

older man X-ed the fabric below the wound and began crossing the ends upward toward the shoulder as if he were wrapping leggings.

The front-rank legionaries who had not simply flopped on the ground were wandering in a daze of exhaustion, some of them dragging their shields and many with their armor unlaced. A line of shouting, laughing men climbed back over the wall of the enemy camp, carrying above their heads a single sheet of bronze three feet wide and at least ten times that length.

"Their drum," said Clodius, glancing in the same direction. His fingers, dark with blood and grime, tied off the bandage in a neat square knot. "Their signaller."

"Hey, Gnaeus," said one of the soldiers nearby, brought to awareness by the file-closer's voice. "Where do we get water? We're—oh. Hi, sir."

The last to Vibulenus, recognized also, and the legionary who spoke was Pompilius Rufus with his cousin Niger beside him. Both men carried their helmets in their right hands. Rufus' was missing its crest: the whole socket had been sheared from the peak of the otherwise undamaged headgear.

"They didn't bring the servants on the ship with us," said Gnaeus Clodius Afer, lifting his head and peering back in the direction from which they had deployed. The huge metal vessel onto which they had marched under Parthian guard and which they had exited again in a very different place was out of sight in a canyon lying parallel to this much gentler valley. "I lost three good slaves. Would've brought me a nice bit of coin back to Rome . . . if we'd gotten back to Rome. . . ."

"I'll," said Vibulenus, alert enough again to be an officer responsible for the well-being of his men, "go demand—"

He tried to get up. Everything went blank for an

instant, until the shock of his buttocks crashing onto the ground returned him to buzzing consciousness. His skin felt as if it were expanding because someone was stuffing it with hot sand.

"Steady there, sir," said one of the legionaries. Clodius had caught the tribune's left wrist as he fell, so that the wound did not bang agianst the breastplate.

"Hercules, I felt fine," Vibulenus muttered. He *still* felt fine, no pain except for an embarrassment that was worse than the transient burning sensation.

"Sir," asked Niger, "where did you get these?"

The young legionary's hand brushed Vibulenus' hair and then proudly displayed his capture, a glossy brown insect whose wingtips were now pinched together between thumb and forefinger. It was trying to arch its tail back against the prisoning fingertips, though the tribune did not see a sting.

"Well, that's a wasp, Niger," Rufus said with a tinge of "of course" in his voice.

Vibulenus reached up to squeeze the right side of his scalp, which had a crawling sensation in contrast to the severe throb on the left side where he remembered the spearshaft clubbing him. Maybe that was why he felt dizzy. . . .

"Who this side of Hades—" the file-closer began.

Rufus interrupted, "Watch that, Gaius!" and grabbed Vibulenus' wrist, treating him in an emergency as a boyhood friend rather than superior officer. "There's three on you and maybe they bite."

"I'm not sure it's wasps," Niger said, transferring the first-plucked example to his left hand and reaching for another. Something buzzed away from the tribune's scalp, brushing his ear as it did so. "They've got just the two wings, see—" He held out a second squirming captive.

His cousin reached for the tribune's head with thumb and forefinger extended, saying, "Well, these men we're fighting. *They* don't look like—"

What Vibulenus hoped was the last of the insects escaped ahead of Rufus' fingers, its wings beating what seemed to be an angry note. Perhaps he was projecting his own irritation onto the wasp.

"That's what I *mean*, don't you see?" explained Niger, gesturing with both trapped insects like a priest conducting some sort of bizarre rite. "Things don't look like what we're used to in this part of Parthia—"

Vibulenus glanced sharply at Clodius, but the file-closer appeared to have heard nothing to which he would take exception.

"—so maybe these're *bees*, not wasps, and I can make mead, honey-wine, if I can find their hive," the legionary finished triumphantly.

His cousin grimaced, then said apologetically to the tribune, "Niger's been fancying his chances to make mead ever since we boarded ship at Brundisium."

"Well, what *are* the damned things doing on his excellency?" demanded the file-closer. The respect in his words was mostly formal, because as he spoke he unceremoniously squeezed at the edges of the pressure cut on Vibulenus' scalp to determine its severity. Clodius' touch syncopated the measured beat of the pain in the tribune's head, but it did not make it worse.

"Well, we always helped Daddy make it," Niger said defensively, "and I just thought as it'd make things, you know, more like home."

"There's something sweet. . . " Rufus said, touching the right side of Vibulenus' scalp gently and bringing his fingertip back to sniff, then tongue. "Don't think it's honey."

He, his cousin, and even Clodius Afer reached out simultaneously to continue the examination. Vibulenus, feeling like a common serving dish at a banquet, lurched upright and this time gained his feet with only a momentary spell of dizziness.

"Pollux!" he muttered as he swayed, the others rising also with expressions of concern both for his condition and the way that they, also detached from routine by the events of the morning, had been treating an officer.

"I'm going to go over there," Vibulenus said with careful distinctness, pointing toward the command group which had at last reached the enemy camp, "and demand to know why there are no water bearers."

"All right. . . " said the file-closer. He bent to pick up his helmet and shield. The vermilioned leather face of the latter had been gouged in a score of places, and a flint point had been driven deep enough into the plywood to cling there even after the shaft was broken off. "You two," he ordered the Pompilii. "Pick up your gear and come along. We're going to escort his excellency."

"There's water, sir," said Niger, pointing in a gesture distorted by the fact that he still held an insect.

At first the tribune thought Niger meant the gigantic turtle which floated down the line of first contact, moving toward the left flank. The device was particularly evident at the moment Vibulenus glanced back because it was lifting five or six feet in the air to clear the wreckage of two war cars, one run up on the other when javelins killed the drivers of both.

But besides the larger device, there were a dozen or more smaller scurrying constructs, coursing up the slope toward the victorious legion. A fountain on the back of each bubbled high enough to dazzle in the sun. The vehicles were each the size of an ox, small only by contrast with the metallic turtle. They moved at a respectable pace, faster than a man marching, but their jets of water were angled so that they fell back onto the vehicles instead of being wasted on the ground.

"I'm still going to see the Commander," said Vibulenus abruptly. He was not sure whether the decision was the result of reason or because he was dazed and as dangerously monomaniacal as he had been when he returned to the front of the battle without his shield or helmet.

What the young tribune *did* know was that he had been driven by fear ever since he met the Parthians as a member of Crassus' army, and the rain of arrows from those horsemen had continued for an afternoon that seemed eternity. The battle this morning had shown him that there was something in the world to strive for besides freedom from fear: there was success, in terms however limited; and there was the respect of men who were now his fellows, because he had been their fellow when the chips were down.

If it was not strictly the duty of Gaius Vibulenus Caper to find a place in the front rank of the legion, then it was surely the business of an officer to look after the welfare of his men. It was time to ask the questions that he had been afraid to ask when they were marched aboard the giant vessel or later when they were mustered again in its hold and deployed here—wherever *here* was.

"Well, come on, dammit!" Clodius Afer snapped to the legionaries. "Get your *gear* together."

Niger sighed. He freed his hands by tossing the maybe-bees off in ballistic arcs from which they did not recover until, ten feet away from their captor, they were beyond accurate sight range. They hovered for a moment to get their bearings, then sailed off as copper glints in the air. "I sure wish . . . " the legionary murmured as his eyes tracked them. Donning his helmet and lifting his shield by one handle, he followed the others.

Vibulenus checked the blade of the sword he was carrying. He was pleased that he was so alert. Pleased, in fact, that he had not simply forgotten the weapon

on the ground where he sprawled. His left arm was beginning to throb in the intervals in which his head did not, but there was no return of the nausea he had felt just after being clubbed down.

The sword was not clean, but what Vibulenus had not wiped off on the grass was at least dry. He sheathed the weapon, swaying a little because his balance did not seem to be everything it should have been.

"They're picking up bodies," said Rufus, squinting toward the floating turtle on the opposite side of the valley.

"No it's not," insisted his cousin. "Look, you can see there's bodies still lying there behind it." He paused before adding, "Maybe it's the *wounded* it's picking up."

The glance Vibulenus risked to the side told him only what he had expected: that he would fall down if he tried to walk without keeping his eyes straight ahead. He continued forward with thirty-inch marching steps. That stride, ingrained during training, was easier for him to maintain than shorter paces. Every time his left heel struck the ground, jagged lightning flashed in his arm. When his right boot came down, dull thunder echoed from his skull. The muscles of his face bunched tautly about the prominent bones.

"No, it's taking bodies," said the file-closer. "*Some* bodies. I saw Crescens of the Fourth Century skewered the same time Vacula bought it."

And I *nearly bought it*, interjected the tribune's mind but not his mouth.

"Vacula's still lying there," Clodius continued, "and all the big wogs we chopped are there, but I don't see Crescens at all."

"Maybe—" offered Niger.

"And maybe he *didn't* crawl off with three foot of spear through his middle," the file-closer snapped to

crush the suggestion even before it had been articulated.

A mobile fountain had halted nearby when a legionary stepped close to it. Now the vehicle was surrounded by thirsty men, baked in their armor by their exertions and the climbing sun. The vehicle was broader than Vibulenus had realized, so that thirty or forty men at a time were able to slurp, dip, or even duck their heads into the water. The fountain continued to dance playfully above them.

"Keep moving," Clodius Afer gruffly ordered the accompanying legionaries, but he himself angled toward the fountain. He jogged the first steps but quickly fell back to a walk.

Vibulenus noticed that the file-closer was favoring his left leg and felt pleased by the fact in a guilty way. It proved that he hadn't been the only one who took a battering this morning. Then the tribune remembered Vacula flopping backward with a ragged hole in the middle of his face. He touched two fingers to the bruise on his forehead left when his helmet was hammered off, and his skin flushed with embarrassment that he had felt his own injuries were exceptional.

Clodius doffed his helmet. Vibulenus thought he might plan to use it for a club to get through the soldiers already struggling for water, but the file-closer instead used the edge of his shield to slice his way expertly to the front. There, he dipped the helmet full without ceremony and wrenched his way out of the confusion again to rejoin his companions.

"Now, hold up a minute and *drink*," Clodius said, blocking the tribune's path and extending the brimming helmet from which he had not drunk himself as yet. "Sir."

Vibulenus swayed as he halted, but he squeezed his eyes shut and felt his body steady while his retinas pulsed alternately red and violet. He took the

helmet, shocked by its weight, and managed to inhale part of the mouthful he awkwardly gulped. Coughing, he handed the makeshift container back to Clodius while trying to nod his thanks because he could not speak.

It was good water, cold at least. Though flavored by the file-closer's sweat as well as the dust and phlegm coating Vibulenus' own throat, the water left no mineral aftertaste.

The tribune looked at the fountain and thought about the larger equivalent of that floating construct, the vessel which had brought them here. He understood nothing about either, except that they *were* here, and that the water was water. . . . The arcs and circular dead ends in which the young officer's brain spun were so perfectly empty that they acted as an anodyne to the pain of his body, even after all four of them drank a second time and he prepared to march on toward the Commander.

"Everybody all right?" Clodius Afer asked in a cautionary tone, the helmet poised between his palms and the hinged cheek pieces flopping over the backs of his hands.

"Yessir," chorused the legionaries, while Vibulenus lifted his beardless chin in assent and said, "Yes, thank you, I feel much better."

That was true, though the tribune did not know whether it resulted from the water, the pause, or simply that the pain was beginning to overcome his capacity to feel it.

"That's fine," said the file-closer with a wicked grin. He put his helmet back on. The water that still nearly filled it poured over his head and down the links of his mail shirt like a stream cascading through rapids. "*Damn* but I needed that," the non-com remarked, continuing to grin.

Vibulenus found that the incident made his youthful honor prickle. Had the veteran made a fool of

him, getting the officer to surrender the water that could have bathed him instead?

"You earned it," the tribune said, saved by his instincts. He clapped the older man on the shoulder as they strode off together toward the camp.

Legionaries who had scaled the enemy's sloping wall were now staggering back with all manner of loot, most of it as odd as the huge bronze sheet that early-comers had carried off. Vibulenus noticed a trio of soldiers returning through the gate, passing a skin of what he supposed was wine. They supposed it was wine also; but, like a scene from a farce, they spewed up the entire contents of their stomachs and collapsed on a count of three.

Another legionary tried to drag the skin out from under the third victim before all the liquid dribbled out. A wiser companion tugged him away.

During the battle, the gate of the enemy camp had been closed by a framework around which were woven briars, a sort of vegetation Vibulenus had not encountered in the valley. Some of the panicked native troops had pulled the barrier aside to flee in one direction or the other. The opening made little difference, because the sloping wall was only a slight impediment without troops willing to defend it.

The Commander and his mounted entourage, who had entered by the gate, were making a dignified exit through the same opening when Vibulenus reached it. The bodyguards stalked out in pairs until six of them were aligned in front of the entrance, armored ankle to armored ankle, to block any Romans who might wish to accost the Commander.

As Gaius Vibulenus did.

The young tribune stepped ahead of his companions, to within six feet of the mounted guards and well within reach of their long-shafted maces. Two of the beasts growled, and a third hunched down on his

forequarters, baring his teeth. A gap had been cut in the beast's upper molars to insert a bit.

The guard made no attempt to draw up on his reins. Gravel scattered beneath the creature's non-retractile claws, one of which was bloodied, as the paws extended toward Vibulenus.

"I wish to speak to the Commander," the tribune said in the piercing, inescapable voice which his throat provided at need. "I am Gaius Vibulenus Caper; citizen, military tribune, and member of the equestrian order." In fact, his family was wealthy enough that his father could have bought a Senate seat if he had wanted the trouble . . . and not that it made the least difference any more, except in Vibulenus' mind and the minds of those captured with him.

There were slotted disks a foot in diameter and four inches thick on the chests of all the lion-like mounts. Vibulenus had assumed the disks were part of the beasts' protection but now, as close as he was, he could see this was not the case: the actual armor was formed by blankets of heavy iron scales wired to a leather backing, cut away at the breast so as not to foul the disks—which moaned constantly. From the motion of dust particles, the tribune saw that air was being drawn in fiercely through the slots.

A guard raised the perforated visor of his helmet. The face beneath the iron was broad and brown and looked more like that of a toad than anything else in the tribune's previous experience. He could hear a gasp behind him—from Clodius, he thought. None of them had seen the guards' faces before.

"Get out of the Commander's way," the guard boomed, Latin in a voice so low-pitched that the words, though distinct, were barely intelligible.

Upright, the mount was as high at the shoulder as Vibulenus was tall. Even with its forelegs outstretched, the beast's eyes glared from behind filigreed protectors on a level with the tribune's. The eyes were set

frontally, like those of a man or a lion, giving the good depth perception a predator needs but not the nearly 360° field of view that makes a horse sure-footed.

"I must speak to the Commander!" Vibulenus shouted. He set his shoulders, but he could not bear to front the line of guards squarely. Rather, his left side was slightly advanced, and he was glad that he had lost his shield because otherwise he could not have kept from cringing behind it.

The beast carried its rider a clawed step closer, breaking the alignment and bathing the tribune in an exhaled breath compounded of dead meat and less familiar odors.

Vibulenus heard the sound of metal behind him, the ringing of a sword edge as it cleared the lip of its sheath. He did not dare turn his back, but he opened his mouth to shout a warning to his companions—to his fellows, to his friends—not to escalate matters into disaster.

Before the tribune could speak, a voice from behind the guard advancing on him croaked an order made obvious by its timbre although it was not in anything Vibulenus recognized as a language. He thought another guard had spoken, but when those of the front rank reined their mounts aside, the Roman recognized his error.

There were three riders behind the front line of guards, two of them Roman tribunes on horses. The third mounted personage rode a beast like those of his bodyguard, though its only armored trappings were studs on the reins and the saddle between the beast's high, humped shoulders. Because it was not covered in iron, the mount had even more of a shaggy, carnivorous look than did those of the guards, but it was under perfect control as it advanced with measured strides into the gap the guards had provided.

"What is it you want to say, Gaius Vibulenus Ca-

per?" asked the Commander, leaning forward as he spoke, past the bristly mane of his mount.

He looked tiny on his present perch, though he had seemed a man within normal limits earlier, when he presided over the mustering and reequipping of the legion in the hold of the vessel. Vibulenus had assumed the Commander was human, as he had assumed the warriors the legion met and slaughtered in this valley were human for all their height and the feathers which grew from the sides of their skulls.

But the toadlike bodyguards were not men, even if the tales were true of Nubia, where the Blemmyes were said to wear their heads in their bellies and other men sported tails. If the guards were not human, then there was no certainty of anyone except the legionaries themselves. . . .

Falco smirked down from horseback. Vibulenus felt a rush of loathing greater than anything the face of the guard had drawn from him.

"I demand to know why we are here," he cried, speaking loudly because the intake whine of the disks on the guard beasts added to something like a howl. The disk on the breast of the Commander's own mount was connected to the beast's throat by a short metal hose, and similar rigging seemed to lurk beneath the armor of the other mounts. "We are Roman citizens!"

"You are here to fight, Roman citizen," said the Commander. There was a high squeal, the sound of an axle with an unlubricated bearing, but it came from the Commander's slight body as his bellowed order to the guards must have done. "To fight for my trading guild on worlds where the Federation does not permit weapons of higher than the local technology.

"And you fought splendidly, Roman. Superbly."

The Commander wore body-covering tights whose fabric was the same shade of blue as the mobile fountains. His face was the only part of him which

the suit did not cover, and the flesh there returned sunlight in a direct reflection like that of metal or glass when the angle was right. The hands that gripped the reins, and the feet that rested on the pegs which the Romans were learning to call stirrups, each seemed to have six digits beneath the soft blue cloth.

"I don't—" the tribune said. "Understand," Vibulenus would have continued, but that would be pointless. "Where *are* we?" he asked instead, the timbre of his voice rising with desperate emotion instead of rhetorical effect.

"That doesn't matter," the Commander replied simply. Probably that answer would have done as well for the other statement, the one Vibulenus had swallowed. "You won't be asked to do anything unfamiliar to you. Anything—" his six-fingered hand gestured broadly toward the wrack of bodies lying on the far slope, giant warriors strewn like driftwood storm-tossed on a beach "—anything but what you do so well. And—" the Commander withdrew his hand and straightened in the saddle "—you will become immortal."

The sun glittered off a variety of new facets as the Commander's face drew up in what might be a grimace. "That is," he added, "your bodies will not age. Not ever again."

His lips did not move when he spoke. The flawless Latin of his statements came from a black embroidery on the fabric covering his throat.

There was another sound in the air, like the suction wheeze of the beasts' equipment, but louder and from above. Over it, Vibulenus shouted, "Will you send us home? We can pay you. *Rome* will pay you a rich ransom."

As she had not ransomed the soldiers of Regulus, captured in similar ignominy, but even a slave could hope, could pray. . . .

"Release you?" the Commander paraphrased. He

squealed again in apparent humor. "Oh, no, Roman. You're far too valuable for *that*. And now, I must report to my superiors. You'll be given further details when you've mustered aboard the vessel for your next assignment."

The roar from above was expanding into echoing thunder beside which the warriors' vibrating bronze sheet faded to pale mockery and even a true storm would have been inaudible. Vibulenus looked up as men all over the valley were looking, shading their eyes with a hand or simply gaping in open-mouthed wonder.

The young tribune had guessed that they had come to this place in a ship, a vessel that sailed upon land as those with which he was familiar sailed on water. The thing that roared a hole in the sky as it slowly descended was a ship like that which the legion had marched aboard in Parthia, but it did not slide over the land.

"What—" the tribune began and paused when he realized that, even if he shouted, his words could not possibly be understood. Some legionaries were throwing off their helmets so that they could clamp both palms over their ears.

As if he were speaking within the tribune's skull, the Commander's voice answered the uncompleted question: "Now that we have defeated the king who refused us trading rights, the trading mission can go ahead. But move aside, tribune, or you'll require a full physical rebuild yourself."

Vibulenus caught the hint of a croaked order like that which had opened a path through the bodyguard so that the Commander could speak with the young Roman. He stumbled out of the guards' way as they, having heard the new command as clearly as the tribune had heard the last words directed to him, spurred their huge mounts back across the valley.

The pair of Romans accompanying them yipped

and kicked their horses, getting off to a less abrupt start than the carnivores of the guard but falling into a fluid canter that looked more comfortable than the others' loping gait. The remainder of the twenty-strong bodyguard followed, surrounding the blue spark of the Commander. Most of them had raised their visors now that the fighting was over, displaying their bulbous eyes and their broad, expressionless mouths.

The descending ship dropped below the ridge, toward the canyon in which the legion's vessel already waited. For a moment, the thunder was redirected upward and the ground quivered in trying to absorb the noise. Then it muted to a growl and ceased entirely. The silence that followed was so complete that Vibulenus could again hear insects buzzing in his hair, where the tree with which he had collided had sprayed him.

"What's it *mean*, sir?" begged Clodius Afer. The prospect of battle had made the file-closer tense and irritable, but he was a veteran of other wars. What he had just seen was an object the size of the Circus Maximus, descending slowly through the air as if it were a feather and not something that could hold a hundred and fifty thousand human beings. "What's going to *happen*?"

"I don't know, Gnaeus," the tribune said, using the file-closer's first name because he knew in his guts that there was no rank or class at a time like this. "But if we wait long enough, maybe we'll find out."

And if what the Commander had said about agelessness were true, they would be able to wait a very long time.

EDITOR'S INTRODUCTION TO:
"Aftermaths"

Last issue we settled the hash (or so we fondly believe) of those who regard *Far Frontiers* as a reactionary-conservative magazine. This time we're after those who consider us to be militarists. Just as we are no more reactionary than Thomas Jefferson, so we are no more militaristic than William Tell, hero of that other revolution in which the middle class gave the damned aristocrats their walking papers.

Speaking of the Swiss, how have they, alone among European nations, avoided war for all the centuries since their revolution? Hint: it's not because they are filled with sweet reason and smile a lot. No, Switzerland has been free and peaceful, in fair weather and foul, century in and century out, because they have always been armed to the teeth. Currently every male citizen must have in his possession, along with the rest of a soldier's field kit, an assault rifle and plenty of ammunition. And what they have done to the Alps would make an environmentalist cry: like Swiss cheese, and every hole contains a hot reception for unfriendly strangers.

The Swiss have gone to all this trouble because they hate the very idea of war, and they understand the preemptive remedy. Hitler would have dearly loved to have his very own Swiss chalet, but since every plausible battle plan called for the expenditure of at least 80 divisions to take "little" Switzerland, well, maybe settle for a dacha on the Black Sea. Even a small land-locked country can make itself too expensive to take.

Like the Swiss, we too are very friendly and loathe the thought of war—so much so that we urge our

government to spend all that is necessary to avoid it. As for why war is to be avoided, consider this story by a lady who is destined for sf stardom. It's about cleaning up after a major battle. And these are the *winners*, mind you. . . .

—JPB

"Aftermaths" is a postlude to the author's SHARDS OF HONOR, a work that is easily mistaken for a slam-bam space war novel, but that is really about clashing cultural certainties and romantic love versus honor. (Baen Books, June 1986.)

AFTERMATHS

Lois McMaster Bujold

The shattered ship hung in space, a black bulk in the darkness. It still turned, imperceptibly slowly; one edge eclipsed and swallowed the bright point of a star. The lights of the salvage crew arced over the skeleton. *Ants, ripping up a dead moth,* Ferrell thought. *Scavengers . . .*

He sighed dismay into his forward observation screen, and pictured the ship as it had been, scant weeks before. The wreckage untwisted in his mind—a cruiser, alive with patterns of gaudy lights that always made him think of a party seen across night waters. Responsive as a mirror to the mind under its Pilot's headset, where man and machine penetrated the interface and became one. Swift, gleaming, functional . . . No more. He glanced to his right, and cleared his throat self-consciously.

"Well, Medtech," he spoke to the woman who stood beside his station, staring into the screen as silently and long as he had. "There's our starting point. Might as well go ahead and begin the pattern sweep now, I suppose."

"Yes, please do, Pilot Officer." She had a gravelly alto voice, suitable for her age, which Ferrell judged to be about forty-five. The collection of thin silver five-year service chevrons on her left sleeve made an impressive glitter against the dark red uniform of the Escobaran military medical service. Dark hair shot with grey, cut short for ease of maintenance, not style; a matronly heaviness to her hips. A veteran, it appeared. Ferrell's sleeve had yet to sprout even his first-year stripe, and his hips, and the rest of his body, still maintained an unfilled adolescent stringiness.

But she was only a tech, he reminded himself, not even a physician. He was a full-fledged Pilot Officer. His neurological implants and biofeedback training were all complete. He was certified, licensed, and graduated—just three frustrating days too late to participate in what was now being dubbed the 120 Day War. Although in fact it had only been 118 days and part of an hour between the time the spearhead of the Barrayaran invasion fleet penetrated Escobaran local space, and the time the last survivors fled the counterattack, piling through the wormhole exit for home as though scuttling for a burrow.

"Do you wish to stand by?" he asked her.

She shook her head. "Not yet. This inner area has been pretty well worked over in the last three weeks. I wouldn't expect to find anything on the first four turns, although it's good to be thorough. I've a few things to arrange yet in my work area, and then I think I'll get a catnap. My department has been awfully busy the last few months," she added apologetically. "Understaffed, you know. Please call me if you do spot anything, though—I prefer to handle the tractor myself, whenever possible."

"Fine by me." He swung about in his chair to his comconsole "What minumum mass do you want a bleep for? About forty kilos, say?"

"One kilo is the standard I prefer."

"One kilo!" He stared. "Are you joking?"

"Joking?" She stared back, then seemed to arrive at enlightenment. "Oh, I see. You were thinking in terms of whole—I can make positive identification with quite small pieces, you see. I wouldn't even mind picking up smaller bits than that, but if you go much under a kilo you spend too much time on false alarms from micrometeors and other rubbish. One kilo seems to be the best practical compromise."

"Bleh." But he obediently set his probes for a mass of one kilo, minimum, and finished programming the search sweep.

She gave him a brief nod and withdrew from the closet-sized Navigation and Control Room. The obsolete courier ship had been pulled from junkyard orbit and hastily overhauled with some notion first of converting it into a personnel carrier for middle brass—top brass in a hurry having a monopoly on the new ships—but like Ferrell himself, it had graduated too late to participate. So they both had been rerouted together, he and his first command, to the dull duties he privately thought on a par with sanitation engineering, or worse.

He gazed one last moment at the relic of battle in the forward screen, its structural girdering poking up like bones through sloughing skin, and shook his head at the waste of it all. Then, with a little sigh of pleasure, he pulled his headset down into contact with the silvery circles on his temples and midforehead, closed his eyes, and slid into control of his own ship.

Space seemed to spread itself all around him, buoyant as a sea. He was the ship, he was a fish, he was a merman; unbreathing, limitless, and without pain. He fired his engines as though flame leapt from his fingertips, and began the slow rolling spiral of the search pattern.

"Medtech Boni?" he keyed the intercom to her cabin. "I believe I have something for you here."

She rubbed sleep from her face, framed in the intercom screen. "Already? What time—oh. I must have been tireder than I realized. I'll be right up, Pilot Officer."

Ferrell stretched, and began an automatic series of isometrics in his chair. It had been a long and uneventful watch. He would have been hungry, but what he contemplated now through the viewscreens subdued his appetite.

Boni appeared promptly, and slid into the seat beside him. "Oh, quite right, Pilot Officer." She unshipped the controls to the exterior tractor beam, and flexed her fingers before taking a delicate hold.

"Yeah, there wasn't much doubt about that one," he agreed, leaning back and watching her work. "Why so tender with the tractors?" he asked curiously, noting the low power level she was using.

"Well, they're frozen right through, you know," she replied, not taking her eyes from her readouts. "Brittle. If you play hot-shot and bang them around, they can shatter. Let's stop that nasty spin, first," she added, half to herself. "A slow spin is all right. Seemly. But that fast spinning you get sometimes—it must be very unrestful for them, don't you think?"

His attention was pulled from the thing in the screen, and he stared at her. "They're *dead*, lady!"

She smiled slowly as the corpse, bloated from decompression, limbs twisted as though frozen in a strobe-flash of convulsion, was drawn gently toward the cargo bay. "Well, that's not their fault, is it? —one of our fellows, I see by the uniform."

"Bleh!" he repeated himself, then gave vent to an embarrassed laugh. "You act like you enjoy it."

"Enjoy? No . . . But I've been in Personnel Retrieval and Identification for nine years, now. I don't mind. And of course, vacuum work is always a little nicer than planetary work."

"Nicer? With that godawful decompression?"

"Yes, but there are the temperature effects to consider. No decomposition."

He took a breath, and let it out carefully. "I see. I guess you would get—pretty hardened, after a while. Is it true you guys call them corpse-sicles?"

"Some do," she admitted. "I don't."

She maneuvered the twisted thing carefully through the cargo bay doors and keyed them shut. "Temperature set for a slow thaw and he'll be ready to handle in a few hours," she murmured.

"What do you call them?" he asked as she rose.

"People."

She awarded his bewilderment a small smile, like a salute, and withdrew to the temporary mortuary set up next to the cargo bay.

On his next scheduled break he went down himself, drawn by morbid curiosity. He poked his nose around the doorframe. She was seated at her desk. The table in the center of the room was yet unoccupied.

"Uh—hello."

She looked up with her quick smile. "Hello, Pilot Officer. Come on in."

"Uh, thank you. You know, you don't really have to be so formal. Call me Falco, if you want," he said, entering.

"Certainly, if you wish. My first name is Tersa."

"Oh, yeah? I have a cousin named Tersa."

"It's a popular name. There were always at least three in my classes at school." She rose, and checked a gauge by the door to the cargo bay. "He should be just about ready to take care of, now. Pulled to shore, so to speak."

Ferrell sniffed, and cleared his throat, wondering whether to stay or excuse himself. "Grotesque sort of fishing." *Excuse myself, I think.*

She picked up the control lead to the float pallet,

and trailed it after her into the cargo bay. There were some thumping noises, and she returned, the pallet drifting behind her. The corpse was in the dark blue of a deck officer, and covered thickly with frost, which flaked and dripped upon the floor as the medtech slid it onto the examining table. Ferrell shivered with disgust.

Definitely excuse myself. But he lingered, leaning against the doorframe at a safe distance.

She pulled an instrument, trailing its lead to the computers, from the crowded rack above the table. It was the size of a pencil, and emitted a thin blue beam of light when aligned with the corpse's eyes.

"Retinal identification," Tersa explained. She pulled down a pad-like object, similarly connected, and pressed it to each of the monstrosity's hands. "And fingerprints," she went on. "I always do both, and cross-match. The eyes can get awfully distorted. Errors in identification can be brutal for the families. Hm. Hm." She checked her readout screen. "Lieutenant Marco Deleo. Age twenty-nine. Well, Lieutenant," she went on chattily, "let's see what I can do for you."

She applied an instrument to its joints, which loosened them, and began removing its clothes.

"Do you often talk to—them?" inquired Ferrell, unnerved.

"Always. It's a courtesy, you see. Some of the things I have to do for them are rather undignified, but they can still be done with courtesy."

Ferrell shook his head. "I think it's obscene, myself."

"Obscene?"

"All this horsing around with dead bodies. All the trouble and expense we go to collecting them. I mean, what do they care? Fifty or a hundred kilos of rotting meat. It'd be cleaner to leave them in space."

She shrugged, unoffended, undiverted from her

task. She folded the clothes and inventoried the pockets, laying out their contents in a row.

"I rather like going through the pockets," she remarked. "It reminds me of when I was a little girl, visiting in someone else's home. When I went upstairs by myself, to go to the bathroom or whatever, it was always a kind of pleasure to peek into the other rooms, and see what kind of things they had, and how they kept them. If they were very neat, I was always very impressed—I've never been able to keep my own things neat. If it was a mess, I felt I'd found a secret kindred spirit. A person's things can be a kind of exterior morphology of their mind—like a snail's shell, or something. I like to imagine what kind of person they were, from what's in the pockets. Neat, or messy. Very regulation, or full of personal things . . . Take Lieutenant Deleo, here. He must have been very conscientious. Everything regulation, except this little vid disc from home. From his wife, I'd imagine. I think he must have been a very nice person to know."

She placed the collection of objects carefully into its labeled bag.

"Aren't you going to listen to it?" asked Ferrell.

"Oh, no. That would be prying."

He barked a laugh. "I fail to see the distinction."

"Ah." She completed the medical examination, readied the plastic body bag, and began to wash the corpse. When she worked her way down to the careful cleaning around the genital area, necessary because of sphincter relaxation, Ferrell fled at last.

That woman is nuts, he thought. I wonder if it's the cause of her choice of work, or the effect?

It was another full day before they hooked their next fish. Ferrell had a dream, during his sleep cycle, about being on a deep-sea boat, and hauling up nets full of corpses to be dumped, wet and shin-

ing as though with iridescent scales, in a huge pile in the hold. He awoke from it sweating, but with very cold feet. It was with profound relief that he returned to the pilot's station, and slid into the skin of his ship. The ship was clean, mechanical and pure, immortal as a god; one could forget one had ever owned a sphincter muscle.

"Odd trajectory," he remarked, as the medtech again took her place at the tractor controls.

"Yes . . . Oh, I see. He's a Barrayaran. He's a long way from home."

"Oh, bleh. Throw him back."

"Oh, no. We have identification files for all their missing. Part of the peace settlement, you know, along with prisoner exchange."

"Considering what they did to our people as prisoners, I don't think we owe them a thing."

She shrugged.

The Barrayaran officer had been a tall, broad-shouldered man, a commander by the rank on his collar tabs. The medtech treated him with the same care she had expended on Lieutenant Deleo, and more. She went to considerable trouble to smooth and straighten him, and massage the mottled face back into some semblence of manhood with her fingertips, a process Ferrell watched with a rising gorge.

"I wish his lips wouldn't curl back *quite* so much," she remarked, while at this task. "Gives him what I imagine to be an uncharacteristically snarly look. I think he must have been rather handsome."

One of the objects in his pockets was a little locket. It held a tiny glass bubble filled with a clear liquid. The inside of its gold cover was densely engraved with the elaborate curlicues of the Barrayaran alphabet.

"What is it?" asked Ferrell curiously.

She held it pensively to the light. "It's a sort of charm, or memento. I've learned a lot about the

Barrayarans in the last three months. Turn ten of them upside down and you'll find some kind of good luck charm or amulet or medallion or something in the pockets of nine of them. The high-ranking officers are just as bad as the enlisted people."

"Silly superstition."

"I'm not sure if it's superstition or just custom. We treated an injured prisoner once—he claimed it was just custom. People gave them to the soldiers as presents, and that nobody really believes in them. But when we took his away from him, when we were undressing him for surgery, he tried to fight us for it. It took three of us to hold him down for the anesthetic. I thought it a rather remarkable performance for a man whose legs had been blown away. He wept . . . Of course, he was in shock."

Ferrell dangled the locket on the end of its short chain, intrigued in spite of himself. It hung with a companion piece, a curl of hair embedded in a plastic pendant.

"Some sort of holy water, is it?" he inquired.

"Almost. It's a very common design. It's called a mother's tears charm. Let me see if I can make out—he's had it a while, it seems. From the inscription—I think that says 'ensign,' and the date—it must have been given him on the occasion of his commission."

"It's not really his mother's tears, is it?"

"Oh, yes. That's what's supposed to make it work, as a protection."

"Doesn't seem to be very effective."

"No, well . . . No."

Ferrell snorted ironically. "I hate those guys—but I do guess I feel sort of sorry for his mother."

Boni retrieved the chain and its pendants, holding the curl in plastic to the light and reading its inscription. "No, not at all. She's a fortunate woman."

"How so?"

"This is her death lock. She died three years ago, by this."

"Is that supposed to be lucky, too?"

"No, not necessarily. Just a remembrance, as far as I know. Kind of a nice one, really. The nastiest charm I ever ran across, and the most unique, was this little leather bag hung around a fellow's neck. It was filled with dirt and leaves, and what I took at first to be some sort of little frog-like animal skeleton, about ten centimeters long. But when I looked at it more closely, it turned out to be the skeleton of a human fetus. Very strange. I suppose it was some sort of black magic. Seemed an odd thing to find on an engineering officer."

"Doesn't seem to work for any of them, does it?"

She smiled wryly. "Well, if there are any that work, I wouldn't see them, would I?"

She took the processing one step further, by cleaning the Barrayaran's clothes and carefully re-dressing him, before bagging him and returning him to the freeze.

"The Barrayarans are all so army-mad," she explained. "I always like to put them back in their uniforms. They mean so much to them, I'm sure they're more comfortable with them on."

Ferrell frowned uneasily. "I still think he ought to be dumped with the rest of the garbage."

"Not at all," said the medtech. "Think of all the work he represents on somebody's part. Nine months of pregnancy, childbirth, two years of diapering, and that's just the beginning. Tens of thousands of meals, thousands of bedtime stories, years of school. Dozens of teachers. And all that military training, too. A lot of people went into making him."

She smoothed a strand of the corpse's hair into place. "That head held the universe, once. He had a good rank for his age," she added, rechecking her monitor. "Thirty-two. Commander Aristede Vorkal-

loner. It has a kind of nice ethnic ring. Very Barrayaranish, that name. Vor, too, one of those warrior-class fellows."

"Homicidal-class loonies. Or worse," Ferrell said automatically. But his vehemence had lost momentum, somehow.

Boni shrugged. "Well, he's joined the great democracy now. And he had nice pockets."

Three full days went by with no further alarms but a rare scattering of mechanical debris. Ferrell began to hope the Barrayaran was the last pick-up they would have to make. They were nearing the end of their search pattern. Besides, he thought resentfully, this duty was sabotaging the efficiency of his sleep cycle. But the medtech made a request.

"If you don't mind, Falco," she said, "I'd greatly appreciate it if we could run the pattern out just a few extra turns. The original orders are based on this average estimated trajectory speed, you see, and if someone just happened to get a bit of extra kick when the ship split, they could well be beyond it by now."

Ferrell was less than thrilled, but the prospect of an extra day piloting had its attractions, and he gave a grudging consent. Her reasoning proved itself; before the day was half done, they turned up another gruesome relic.

"Oh," muttered Ferrell, when they got a close look. It had been a female officer. Boni reeled her in with enormous tenderness. He didn't really want to go watch, this time, but the medtech seemed to have come to expect him.

"I—don't really want to look at a woman blown up," he tried to excuse himself.

"Mm," said Tersa. "Is it fair, though, to reject a person just because they're dead? You wouldn't have minded her body a bit when she was alive."

He laughed a little, macabrely. "Equal rights for the dead?"

Her smile twisted. "Why not? Some of my best friends are corpses."

He snorted.

She grew more serious. "I'd—sort of like the company, on this one." So he took up his usual station by the door.

The medtech laid out the thing that had been a woman upon her table, undressed, inventoried, washed, and straightened it. When she finished, she kissed the dead lips.

"Oh, God," cried Ferrell, shocked and nauseated. "You *are* crazy! You're a damn, damn necrophiliac! A *lesbian* necrophiliac, at that!" He turned to go.

"Is that what it looks like, to you?" Her voice was soft, and still unoffended. It stopped him, and he looked over his shoulder. She was looking at him as gently as if he had been one of her precious corpses. "What a strange world you must live in, inside your head."

She opened a suitcase, and shook out a dress, fine underwear, and a pair of white embroidered slippers. A wedding dress, Ferrell realized. This woman is a bona fide *psychopath* . . .

She dressed the corpse, and arranged its soft dark hair with great delicacy, before bagging it.

"I believe I shall place her next to that nice tall Barrayaran," she said. "I think they would have liked each other very well, if they could have met in another place and time. And Lieutenant Deleo was married, after all."

She completed the label. Ferrell's battered mind was sending him little subliminal messages; he struggled to overcome his shock and bemusement, and pay attention. It tumbled into the open day of his consciousness with a start.

She had not run an identification check on this one.

Out the door, he told himself, is the way you want to walk. I guarantee it. Instead, timorously, he went over to the corpse and checked its label.

Ensign Sylva Boni, it said. *Age twenty.* His own age . . .

He was trembling, as if with cold. It *was* cold, in that room. Tersa Boni finished packing up the suitcase, and turned back with the float pallet.

"Daughter?" he asked. It was all he could ask.

She pursed her lips, and nodded.

"It's—a helluva coincidence."

"No coincidence at all. I asked for this sector."

"Oh." He swallowed, turned away, turned back, face flaming. "I'm sorry I said—"

She smiled her slow sad smile. "Never mind."

They found yet one more bit of mechanical debris, so agreed to run another cycle of the search spiral, to be sure that all possible trajectories had been outdistanced. And yes, they found another; a nasty one, spinning fiercely, guts split open from some great blow and hanging out in a frozen cascade.

The acolyte of death did her dirty work without once so much as wrinkling her nose. When it came to the washing, the least technical of the tasks, Ferrell said suddenly, "May I help?"

"Certainly," said the medtech, moving aside. "An honor is not diminished for being shared."

And so he did, as shy as an apprentice saint washing his first leper.

"Don't be afraid," she said. "The dead cannot hurt you. They give you no pain, except that of seeing your own death in their faces. And one can face that, I find."

Yes, he thought, the good face pain. But the great—they embrace it.



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MORROW, JAMES

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In the far future, biogenetic engineering results in trees that bear hallucinogenic fruits, and the dreams that they induce become humanity's most popular form of entertainment—until millions of lives are threatened by a vicious terrorist whose dreambeans wreak madness. **55969-9 $2.95**

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POHL, FREDERIK, & KORNBLUTH, CYRIL

Gladiator-At-Law

Newly revised, 1986 edition of the classic novel about a future Earth ruled by a worldwide corporate conglomerate. Anyone who doesn't work for an arm of the company is condemned to a life of poverty on the fringe of society. This is Norvell Bligh's fate after an office enemy sabotages his job. But Bligh, formerly a "company man," decides to strike back against the System—and he knows *just* how to go about it.

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In the far future, Man has colonized the galaxy, and has more potential than he ever dreamed possible—or does he? One day a starship arrives at Halsey's Planet with ominous news: at six previous stops, the starship found no one. Where have the colonists gone, and why? This is a totally revised edition of a classic novel by two masters of science fiction.

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In this freshly revised collaboration by two of science fiction's best writers, Earth is ripped from its orbit by aliens who need human minds for use in their vast computer network. Now, after two hundred years of alien domination, men and women are scarcely more than automatons, doing strictly as they are told. Only the Wolves are different, daring to fight back with individuality and disobedience. The penalty for those who are caught is terrible—but if enough humans turn from Sheep to Wolves, humanity may have a chance.

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Special Note: All three of these Pohl/ Kornbluth novels have been revised not to make them better—hardly possible!—but to make them read as if they had been conceived and executed in 1986.

NEW!

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In the near future, all of humanity lives under the strictly enforced guidance of The Plan of Man—a vast, oppressive set of laws managed by a computer security network. One man vowed to circumvent the law and voyage to the farthest reaches of space—but he has been found out and sentenced to death. A mysterious Power is on his side, however, and it demands not only clemency for Boysie Gann, but an end to the Plan of Man itself. If her rulers refuse, Earth's sun will be snuffed out . . . **65558-2 $3.95**

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REAVES, MICHAEL
The Shattered World
Ardatha the sorceress and Beorn the thief unite with the cult of magicians to undo the millennium-old

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Life under the Deathwish was one big gamble—a gamble that most people lost. Roy Cos has survived twice as long as the average Deathwisher, and has lived the life of ease guaranteed all who buy a Deathwish Policy. But now Mercenaries, Inc. is after him, and he has incurred the wrath of Graf, the world dictator. **65552-3 $3.50**

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Writer Alex Germain returns to a small Mexican village after a 20-year absence, to find a mystery: he sees people who have not aged at all in the 20 years he's been gone—and he is ordered to leave, then threatened. But Germain is determined to solve the riddle of San Raphael. **55913-3 $2.95**

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Archaeologist Dan Fielding is thrust 400 years into the past while exploring the Mexican desert. After being captured by Cortez's soldiers, he is befriended by an Aztec woman who spirits him away to her city. There, he introduces bows, swords, and gunpowder, and changes the course of history.

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(With Michael Banks)
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Harry Gerber and Joe Fletcher discover a way to change reality and the two travel through time and space into an alternate universe, where they are confronted by Harry's evil counterpart. *Publisher's Weekly* called this novel "brilliantly witty." Rucker received the 1983 Philip K. Dick Award for Best Original Novel.
55997-4 $2.95

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What happens in a society of women who have scorned men, and who actively resist their return? Joanna Russ examine the implications of such a society in the style that has made her famous among both SF and mainstream readers. **55906-0 $3.50**

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Gregory Burgess is the ultimate computer criminal, able to obtain success and money through breaking

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NEW!

SABERHAGEN, FRED

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NEW!

STEPHENS, BRYNNE

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An engrossing, mesmerizing tale, reminiscent of Terry Brooks' "Shannara" series and Piers Anthony's "Xanth" novels. Watkin and Kym leave their small village in search of True Love—and encounter princesses and paupers, shadowbats and nightspiders, faeries, trolls, bandits—a veritable cornucopia of twists, turns, and surprises that ultimately lead them to the Dream Palace and its mysterious secrets.

65557-4 $2.95

TILLEY, PATRICK

Cloud Warrior

In an America centuries from now, two rival societies battle for land finally returning to normalcy after long years of devastation. The Mutes, who have strange mental powers, control the above-ground world; the technologically advanced Family moved underground at the time of nuclear holocaust—but now demand the land that once was theirs.

55972-9 $3.50

NEW!

The First Family

The eagerly-awaited sequel to *Cloud Warrior*. Steve Brickman escapes from the Mutes and returns to the underground Federation, convinced that there is a way for the high-tech Federation to work with the Mutes to revive Earth. But he knows too much about the Mutes' strange powers and the Federation's plans for conquest of the Earth, and both sides are after him. Only if the two societies join forces can a better world be made for all . . . but if Brickman is to convince anyone of it, he must first survive . . .

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EDITED BY

JERRY POURNELLE AND JIM BAEN

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